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POULTRY IN MEXICO'S EXPANDING AGRICULTURE

By A. J. G. MAW
The Pennsylvania State University, University Park, Penn., U.S.A.

Keeping pace with the Mexican industrial expansion and development is the task now facing Mexican agriculture. The twin problems of providing sufficient food for an increasing population and improving the diet of the average worker present a challenge to all phases of agriculture.

The rapid industrial development in certain urban areas has resulted in an increased purchasing power by the people of those areas. More and more people want and can afford better balanced diets containing animal proteins, rather than diets composed largely of cereals. To meet the need for a better diet, the production of pork, poultry and eggs is being encouraged by the Mexican Government. So, we find that today poultry production is playing a prominent role in the agricultural development of our neighbor to the South.

The poultry industry has expanded rapidly. Accurate statistics have been hard to obtain, but on the basis of published data it is known, for example, that the number of hens has increased from 21,000,000 in 1950 to 36,000,000 in 1955. The greatest increase has taken place in egg production with many modern plants (Granjas in Mexico) being established close to the larger cities. An important factor in aiding the rapid growth of the industry is the possibility of establishing a poultry farm without too great an outlay of capital. The favorable climate permits a relatively simple type of housing which can be erected at a low per bird cost. A second factor is the fact that there has been no attempt to develop native breeds. Importation of the best strains in this country has been made with the result that good productivity is obtained in most cases from the start of the enterprise. Finally, the demand for poultry products, at least up to the present, has been greater than the supply. Poultry production in Mexico is a business which has attracted more people each year and appears to have been a fairly profitable enterprise.

With the belief that more animal proteins are needed in the diet of the people, the Mexican Government has been very active in promoting the industry in all parts of the country. The efforts of the Government have been directed towards providing good quality chicks at a low price to farmers and poultrymen. During 1954, the Government established a poultry center at the Palo Alto Research Center near Mexico City. From this Center, White Leghorn and New Hampshire chicks bred from imported strains were distributed.

More recently, the efforts of the Government in promoting the industry have been directed towards the establishment of hatcheries in various parts of the country. About twenty of these units are now in operation. Each hatchery has an incubator capacity of 30,000 chicks per month. Sufficient layers are carried at each hatchery to provide the necessary eggs. In addition, brooder houses have been built so that the chicks may be brooded to four weeks of age before being sold. The farmer or poultryman buying these chicks does not need to provide brooding equipment.

Some units have feed mixing facilities, while all have a small laboratory for diagnostic work which is to be under the direction of a trained veterinarian. In some areas where most of the chicks go to commercial poultrymen, sexing is done with the surplus males being sold for meat.

In addition to the Government hatcheries, new private hatcheries are being built, many of which are operating in cooperation with well-established U. S. poultry breeding farms.

It is to be expected that as the income among certain groups of the population increases, a good share of this increase will be spent for more and better foods. Further, the current 3% increase in population each year is providing a steady increase in the consuming public. The emphasis and encouragement being given to the use of more animal proteins may possibly bring about change in the Mexican diet which will lead to an increased use of poultry products. While conditions would appear favorable for a continued development, there are certain limiting factors which may affect the industry. A question of major importance is whether or not Mexico can produce the feed grains needed by its expanding poultry and livestock industry. Studies in Mexico indicate that to meet future feed grain requirements, there will need to be increased yields on present acreages planted to grain crops and new areas of land opened up for planting. Also, it is already evident that certain poultry diseases may be a limiting factor to a successful poultry enterprise. It is believed that steps will be taken in the near future to provide the poultrymen with a much needed diagnostic service and assistance in the prevention and control of disease.

Both allied industry and the Government are well aware of these problems. If adequate feed supplies are available and measures for the prevention and control of disease initiated, there would seem to be a bright future for Mexico's poultry industry.

MAJOR POULTRY PROBLEMS IN LEBANON

MORLEY A. JULL
USOM/Lebanon, American Embassy, Box 301, Beirut, Lebanon

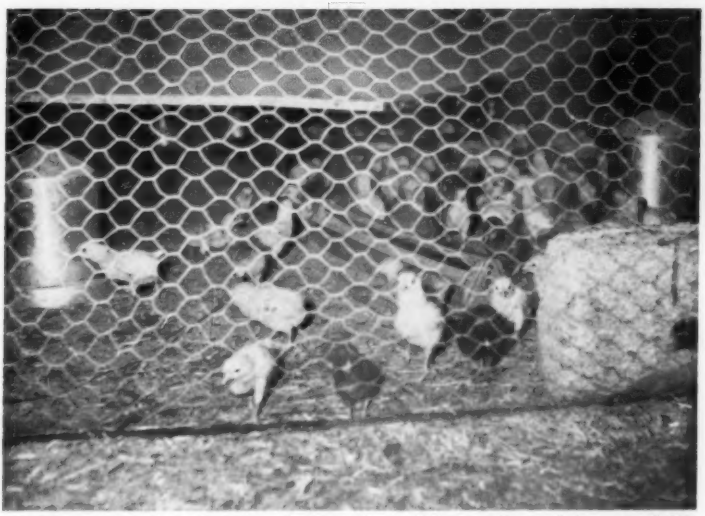
Lebanon covers an area of about 4000 square miles, 1000 of which are under cultivation. Agriculture employs about one-half of Lebanon's total population and accounts for about one-fourth of the national income.

The world renowned Bekaa Valley, the "Granary of Rome" in ancient times, also known as "Abraham Valley" because Abraham took his flocks to graze on the rich pasture lands, has about 41 percent of the total land area of Lebanon and about 14.2 percent of the total population of the country.

According to latest reports, Lebanon imports over 100,000 tons of cereals and staple foods annually. Eggs and chicken meat are imported in considerable quantities, chicken meat coming principally from Holland, the United States, and some from Denmark, Syria and Jordan. Many eggs are imported from Syria and Turkey.

Apparently, an accurate census of the poultry population of Lebanon has never been taken. Moreover, during the past two years, there has been greatly increased activity in the production of broilers and market eggs. For broiler production, New Hampshires and White Plymouth Rocks predominate. For market egg production, Rhode Island Reds and White Leghorns are most popular. On one of largest commercial egg-producing plants operated by Mr. K. Ghattas at Talabaya, in the Bekaa valley, over 5000 chickens are raised every year and over 2000 laying birds are kept in confinement. Incidentally, the males in those pens have the largest combs and wattles I have ever seen. Mr. Hassan Chouman, at Hizzin, in the Bekaa valley, specializes in broiler production. In one house he starts 1000 chicks per week the year round, hot-water heated battery brooders of English make being used. The chicks are imported from Holland. In another house, Mr. Chouman raises several batches of 3000 chicks on the floor each year. He operates a poultry processing plant and sells eviscerated broilers most of two weights one-and-one-half pounds and about 2 pounds or a little over.

There are pens of Black Leghorns, Barred Plymouth Rocks, and New Hampshires. Like Egypt, so also Lebanon has its native or Baladi chicken, smaller in size and laying smaller eggs than the breeds and varieties mentioned previously and apparently it is on its way out.



An oil burning brooder stove such as this one is used in one of the buildings at the Terbol Experimental Station. Lebanon has no coal mines nor oil wells and wood is very scarce. However, electricity is available in most parts of Lebanon.

There is slight interest in turkey raising, less interest in duck raising, but considerable numbers of geese are raised on the good pasture lands of the Bekaa Valley.

Beirut is by far the largest market for eggs and poultry meat, followed by Tripoli, Sidon, Jouneh, and Zahle.

Aside from a course or two on poultry given at the American University of Beirut, there apparently are no other courses on poultry husbandry practices given in Lebanon. The same institution carries on some poultry experimental work at the University farm some 30 miles or so from Beirut, in the Bekaa valley.

The Lebanese Ministry of Agriculture operates an Agricultural Experiment Station in the same general area of the Bekaa valley, experimental work on dairying and poultry problems being the principle activities. Mr. Michael Karam is in charge of the poultry work and his assistant is Mr. Shihadi-El-Rafai.

There are thirteen extension centers where agricultural agents and veterinary agents are located. The agricultural agents at the extension centers should have some appreciation of the relative importance of the poultry industry as a branch of agriculture in Lebanon and should be anxious to be of the greatest possible assistance to farmers with respect to the most efficient management of their flocks.

There are demonstration centers at the three following places: Jabbouli, Jezzine, and Tal-el-Amara.

During recent years, considerable progress has been made through the joint efforts of the officials of the Lebanese Ministry of Agriculture and the officials of the United States Overseas Mission in developing a program of poultry extension, research, and teaching to enable producers to secure better returns from their flocks.

The American University of Beirut gives a course in poultry and the University maintains a poultry farm in the Bekaa valley where some experimental work is carried on.

At Anjar, in the Bekaa valley, there is an Armenian refugee camp of about 3000 people who came from Armenia, the camp having being established in 1939.

Egg production is one of the principal occupations of the refugees.

My contact with these unfortunate people was through the program of poultry extension work carried on by the United States Overseas Mission.

Research Work

The Terbol Experiment Station is located about 40 miles from Beirut in the Bekaa valley. There are two stone poultry houses, each 32.5 feet by 230 feet. Lumber in Lebanon is very scarce and is expensive. One of the poultry houses is devoted

Everything has to have a beginning. The Lebanese farmer shown here is a big landowner and built a garage. However, when he was offered some growing chickens as a project, he used the garage as a poultry house.

A Lebanese farmer, wearing a kaffiya, looks over 35 young White Leghorn pullets and 15 cockerels he has just received from U.S.O.M. officials as a project in which he agrees to supply another Lebanese farmer next year with the same number of each sex. His helper, the author, and Mr. Michel Karam are also shown.

to progeny testing to increase egg production in Rhode Island Reds and White Leghorns and by individual selection of New Hampshire and White Plymouth Rock breeding stock in order to develop faster growing strains of meatier-type broilers.

The other house is for incubation, brooding chicks, storing feed, and conducting tests on feeds for growing chickens.

In the program to develop high laying strains, by progeny testing, different strains of Rhode Island Reds and different strains of White Leghorns are maintained in order that the different strains of each breed can be tested for their combining ability.

In the program to develop superior broiler-producing strains, dominant White Plymouth Rock males are mated to New Hampshire females and New Hampshire males are mated to dominant White Plymouth Rock females. Crossbreeding tends to stimulate rate of growth in progeny. Using a strain of dominant white Plymouth Rocks has the advantage of producing progeny with white plumage. When white-feathered broilers are dressed for market, any pinfeathers that might be present are much less noticeable than in broilers with colored plumage.

Making Feeds Go Further

In Lebanon and other countries, such as Egypt and

Greece, that import corn, wheat, and barley on an extensive scale, it is of the utmost importance that broiler growers and market-egg producers give their birds feed mixtures that will produce broiler meat and eggs on the fewest possible pounds of feed per pound of meat and per dozen eggs, respectively. This can best be accomplished by giving their flocks feed mixtures that provide the birds with the proper energy-protein ratio in their diets.

The results of research work by Dr. G. F. Combs and his associates at the University of Maryland have demonstrated the significant importance of adding animal fat to the diet for broilers and the additional beneficial effects that are obtained when the protein content of the diet is adjusted in proportion to the energy content of the diet. The fact that in one of their experiments their broilers weighed on the average 3.03 pounds per bird at nine weeks of age on an average of slightly less than 7 pounds of feed per bird and an average of only 2-3 pounds of feed per pound of gain in weight should be of very great value to everyone interested in the poultry industry of Lebanon.

At the Terbol experiment station, experiments will be carried on in batteries to determine the best kind of diet to feed for rapid growth.

It would be in the best interests of the poultry producers of Lebanon if the Lebanese Ministry of Agriculture officials would put into effect a feed inspection service for the purpose of determining whether or not the feed mixture in the bag is as indicated by the tag on the bag of feed. It would also be in the interests of the poultry producers of Lebanon if a feed control law is put into effect as soon as possible. The Lebanese Ministry of Agriculture officials would be well advised to employ a well trained poultry nutrition specialist to advise manufacturers in charge of preparing feed mixtures.

Providing Consumers with Superior Quality Eggs

This problem is most important during the hot summer months because in hot, dry weather fresh eggs lose moisture and the thick white and the yolk deteriorate in quality unless they are gathered from the nests several times each day and are kept in as cool a place as possible up to marketing time. A wire basket to collect the eggs permits the eggs to cool more quickly than when they are collected in a metal or wooden pail. Do not allow broody hens to remain on the nests. Except during the breeding season, no males should be allowed with the hens. Each collection of eggs should be taken as

quickly as possible to the coolest room in the house. In addition, the eggs should be marketed as frequently as conditions permit because the older they are by the time they reach the consumer, usually the lower the quality.

There should be made available in Lebanon standard size eggs cartons that will reduce breakage to the minimum. The present practice of using fillers must be very costly due to excessive egg breakage.

Reducing Losses From Mortality

Lebanese poultry producers lose much money because of excessive mortality in their growing chickens and laying flocks Not only is the economic loss from dead chicks and hens often very great, but in addition there should also be considered the cost of retarded growth, poorly finished market birds, and decreased egg production among the birds that manage to live but are infested with parasites and infected with disease organisms.

The fact that more powerful agents than ever are available to add to feed mixtures for the purpose of combatting disease, makes it necessary that those assigned to give advice concerning the proper agents to use be persons who have had

Agricultural extension agents of the Lebanese Ministry of Agriculture being given a demonstration in candling and grading eggs by Mr. Michel Karam, poultry advisor of the Ministry of Agriculture. Note that egg-case fillers are used for handling the eggs. In order to reduce excessive breakage in marketing eggs in Lebanon, it is anticipated that standard-size cartons and strong cardboard egg cases will be used in the near future.

(Photo by Tom Blow)

a thorough training in medical science. The use in feeds of such drugs as sulfamethazane, sulfaquinoxaline or sulfaquanidine to control coccidiosos should be carried out, for the most part, under the direction of a poultry pathologist.

The program of testing breeding flocks for the presence of microorganisms called *Salmonella pullorum* should be carried out under the supervision of properly qualified poultry pathologists.

The enormous economic losses which poultry flocks suffer from coccidiosis makes it appropriate to emphasize that poultry pathologists and veterinarians would render the poultry industry of Lebanon much greater service by teaching poultry producers how to prevent coccidiosis rather than waiting until an outbreak occurs and then urging them to clean up the poultry premises in order to try to keep the disease from spreading.

There is not much use in performing a diagnosis on a dead bird unless the person who made the diagnosis is prepared to offer constructive suggestions to prevent further outbreaks of the disease. Veterinarian and poultry pathologists in Lebanon should attend poultry meetings to advise flock owners concerning various flock management practices that should be followed in order to keep mortality at a minimum.

Administrative Problems

Monthly meetings, at least in the Beirut area, should be organized for the purpose of giving poultry producers an opportunity of discussing problems of mutual interest. These meetings should be attended by Ministry of Agriculture personnel, including poultry pathologists and veterinarians.

In the near future, it is anticipated that monthly poultry meetings will be held at Tripoli, Sidon, and Zahle.

It is suggested that the relatively inactive poultry demonstration centers at Tal-el-Amara, Jezzine, and Jbail be either reactivated or perhaps two of them should be discontinued and more efforts be devoted to the third or perhaps all three units should be discontinued.

It would be very desirable if the Ministry of Agriculture would publish a well illustrated monthly poultry magazine in Arabic to be distributed to all poultry producers in Lebanon. Such a publication would be of great value to poultry producers in all parts of the country. The poultry extension specialists should be able to provide much material for the magazine.

One of the best investments that could be made with re-

spect to improving conditions in the poultry industry in Lebanon would be to send Mr. Michel Karam, my Lebanese counterpart, to the United States for a period of approximately six months in order to gain experience concerning the administration of poultry improvement work, extension, and research.

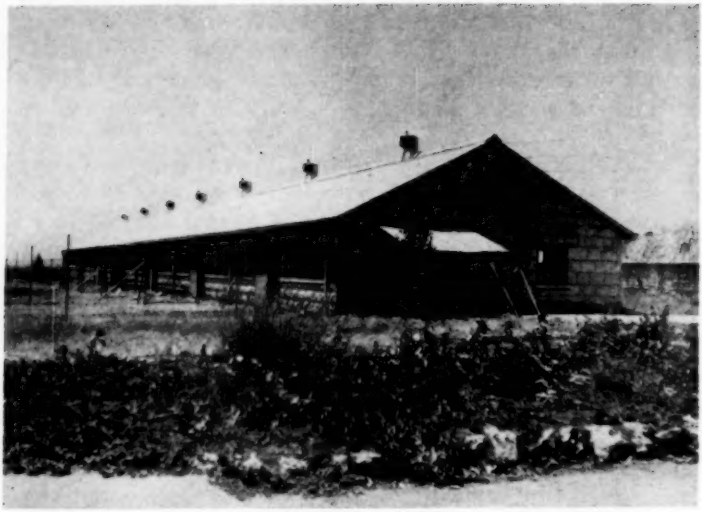
Mr. Karam should spend enough time in one or two States to learn as much as possible concerning the poultry courses that are taught at the University, the kind of poultry extension program that is carried on for the benefit of poultry producers and the kind of research work that is carried on to make egg and poultry-meat production work more profitable.

He should visit some of the egg marketing cooperatives and some of the commercial poultry-processing plants.

Left, a plastic-top incubator used in demonstration work with Armenian refugees at Angar. Several boys and girls (6 of the boys being shown here with the author) raise chickens to provide additional income for their families. Feed for the chickens is grown on a small farm allocated to each family. The face at the upper right is that of Mr. Kandarijien, poultry advisor for the group and a teacher at the school for the refugees.

(Photo by Tom Blow)

From the standpoint of expediting the poultry program carried on at the Terbol experiment station and increasing the efficiency of operation, the services of an assistant should be made available to Mr. Karam to supervise the employees who are carrying on the breeding program and the feeding experiments. Under existing conditions, Mr. Karam is obliged



Lebanese Ministry of Agriculture poultry breeding located at Trebol in the Bekaa Valley. The building is made of stone blocks which are more economical than wood, which is very expensive in Lebanon.

to spend entirely too much of his time traveling back and forth between Beirut and Terbol.

Since the poultry industry in Lebanon has expanded considerably during the past four years and since it is bound to expand relatively faster in the future because of the increase in the human population, it is suggested that when Mr. Karam returns from the United States or shortly thereafter that his assistant be sent to the United States for the same kind of training which Mr. Karam received.

It is also proposed that two Lebanese veterinarians or poultry pathologists who speak English be sent to the United States for six months to attend a semester at a State College of Agriculture that has a good poultry pathology department and to learn how the poultry pathologists most effectively serve the poultry producers.

These two poultry pathologists or veterinarians should visit the poultry pathology section of the Agricultural Research Center at Beltsville, Maryland, in order to learn something about the major phases of research being carried on to make the production of eggs and poultry meat more profitable to producers.

Just a note in closing. One day in June I accompanied two USA extension specialists and Mr. Karam to distribute a considerable number of White Leghorn pullets from 6 to 8

weeks old to some poultry producers in the Bekaa valley. One Lebanese poultryman who received some pullets had two wives, both of whom I met and helped carry some pullets to the "poultry room" of the first wife and other pullets to the "poultry room" of the second and much younger wife. "What a man".

Finally and in conclusion, it can be said that the relative importance of the poultry industry as a branch of agriculture in Lebanon justifies much greater efforts being devoted to improvement of conditions in the industry.

BOOK REVIEW

By W. D. TERMOHLEN

Parnell, E. D.—Profitable Poultry Production. John Wiley & Sons, Inc., New York—1957—pp 393—$4.95.

The title indicates coverage of all kinds of poultry. In this respect it is somewhat misleading since chicken egg production for market and chicken meat production for market is what the book covers in its thirteen chapters. With this made clear it can then be said—a well written and interesting book. The book was written primarily for the use of agricultural students in vocational high schools and junior colleges.

An interesting and useful approach has been used by Professor Parnell by using at the beginning of each chapter "Jobs to be done and decisions to be made". The key points listed under this heading will prove a very effective guide to the student. At the close of each chapter will be found a list of very well thought out questions for study and suggestions, a list of ideas for field trips and laboratory study and a most helpful list of references. The book emphasizes that poultry production is both a science and art. Automation, now a definite part of successful poultry production, receives adequate attention. A recommended book for high school and junior college student and a good addition to the library of the commercial egg or broiler producer and also those servicing those branches of the poultry industry.

LATERAL ASYMMETRY IN PLUMAGE COLOUR AND CREST IN GEESE.

By A. M. GERICKE

Division of Animal Husbandry and Dairying, Pretoria, South Africa

At the farm Kleinfontein, George, Cape Province, the author observed crested geese with peculiar plumage colours. From the available information this flock consisting of about 50 or 60 head of geese has been bred on this farm for 40 or 50 years. No system of breeding was applied but it is thought that Embden blood was introduced into this breed known as the South African Gray Goose. The body weights of 30 geese were recorded in January 1956 and the average weight of males was 6½ lb and that of females 6 lb each. The weight of young geese at approximately 3 months of age was 5.3 lb each. These birds were larger than Egyptian Geese but much smaller than the African, Embden and Toulouse and neither did any approach the standard weight of the Pilgrim and the Italian Roman. Owing to drought conditions the birds were not in the best condition on the date of weighing and evidently these figures should be taken as minimum recordings.

In adult plumage colour the geese showed variations from gray to gray and white and solid white. Various birds were gray with predominantly white wing feathers but five individuals were gray in one wing and white in the other. (Photographs 1 to 5) In the majority of coloured geese approximately two thirds of the neck was gray striped with black but the back and ventral regions were almost solid white (piebaldness).

Unfortunately the wing feathers of the geese were clipped a few days before the photographs were taken. This was necessary as these birds have the common habit of flying to various parts of the farm and in this respect they behave in a similar manner to the Pilgrim which can also fly quite well. In the late afternoon the geese at Kleinfontein have to be gathered and confined to a shed otherwise they fall the prey at night to such stray animals as the otter, a quadruped of the weasel family.

Little information is available of the origin and breeding of the South African Gray Goose execept that birds were imported into this country in about 1657 and 1658. From the description by Quinn (1939) the English Grey and White

Geese were derived from the Normandy in which sexual dimorphism is present in the down and adult plumage. Evidently the French Normandy can also be regarded as the ancestor of the South African Grey Geese. From the breeding results obtained by Jerome (1953) it is not known if the white colour chiefly found in the ganders can be attributed to the influence of the Embden. This investigator found that purebred Embdens are dominant CC but they develop into white adults due to the action of a dilution gene in the presence of the spotted pattern. The influence of the White Chinese can probably be disregarded as this is a recessive white bird. In a cross between those breeds Jerome found that the pattern (white with dark gray spots) is recessive and that the sexlinked dilution can be regarded as dominant in its effect on the spotted pattern. This dilution gene seems to exert a more pronounced effect on the gray of the spotted pattern than on the solid pattern (dark gray shade). Furthermore the intensity of the dilution gene appears to increase with the age of the gosling and as a result these blue tinges in colour diminish with age. From limited data Jerome (1954) found that the pattern solid and spotted result from the action of sexlinked genes.

Jerome proposed the following genetic symbols for various characters in geese:—

Character	Dominant or recessive	Symbol	Autosomal or sexlinked
Colourless	recessive	C	autosomal
Knob on bill	Partial dominant	Kb	autosomal
Neck stripe	Dominant	Ns	?
White breast patch	Dominant	Wb	?
Solid pattern	Dominant	Sp	?
Sexlinked dilution.	Dominant	Sd	sexlinked
Gray	Dominant	G	?

If Embden blood was introduced into the South African Gray geese their plumage colour should have been predominately white in both sexes and their body weight should have been larger. These results have been secured on several farms where these breds were crossed.

The Lateral asymmetry in plumage colour may be due to genetic mosaicism. No less than five birds are involved and theoretically there is no reason to assume that a mutation did not occur in at least one of the genes. This hypothesis has not yet been tested by reciprocal matings.

Hollander (1944) indicated that piebaldness is essentially the co-existence of pigment and non-pigmented areas of inte-

gument. The absence of melanophores or their failure to function is the basis for whiteness of the skin and plumage. The variation in colour may also be confused as the melanophores which originate in the neural crest of the embryo do not remain indefinitely in one place but migrate. Dushane (1944) stated that all pigment cells have a limited life in the feather of normal birds. They migrate into the epidermal base of the feather, deposit their melanin granules and then die. In recessive white breeds the factors affecting pigment cells act to limit melanophore life only when homozygous. Consequently the whiteness of feathers in white breeds either dominant or recessive appears to be due to the pigment cells which degenerate before they deposit significant numbers of melanin granules in the barb and barbule cells of the developing feather. Apart from the genetic constitution of the cells the colour of feathers can also be modified by endocrine secretions during the growing stage.

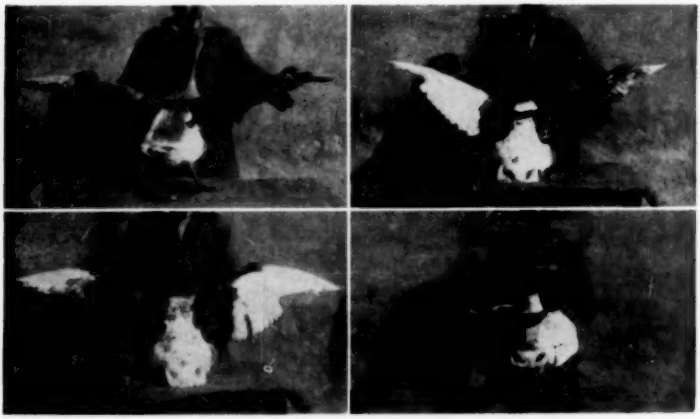


Fig. 1. (upper left): Normal gray colour in the plumage of both wings.
Upper right and lower left: Lateral asymmetry in the plumage colour of the wings which is characteristic of a mosaic.
Lower right: In the gander the division between the colour regions is nearly median except for the dark grey collar.

Asymmetry is probably a normal condition in the reproductive system of birds and is a common feature where piebaldness occur. In these piebald geese there is not a distinct division between the white and gray colours. Hutt (1929) indicated that if no discrepancies in size are evident in the two differing parts, the mosaic is more likely to have resulted from gene mutation than from the elimination or

nondisjunction of chromosomes. Although no skeletal measures were taken all the geese appeared normal in body carriage and gynandrophism was evidently absent. Various cases of variegation in plants and mottling such as flecks, stripes and blotches in feathers have been explained by somatic mutation. Without any evidence of abnormalities in reproduction of these gray geese the mutation theory seems to be an acceptable explanation.

Several birds in the flock exhibited distinctive crests although not as prominent as in fowls or ducks. The small crest consisting of a dense cluster of feathers was unlike the large knob at the base of the upper beak in such breeds as the African and Chinese geese. In crested birds the skull is raised slightly posterior and superior to the eye while in breeds with a knob the skull is raised anterior and superior to the eye.

Fig. 2. A crested bird.

Crests in fowls originate from an incompletely dominant autosomal gene Cr. and homozygous birds may show both crest and hernia. In ducks Rust (1932) stated that crest is also due to an incompletely dominant gene and those which survive are heterozygous for this character. Hutt (1949) indicated that the classification of homozygotes with hernia at hatching time is easy as also in the homozygotes without hernia but in the heterozygotes the identification of the crest is more difficult. Owing to the smallness of the crest in the S.A. Gray goose it will probably be difficult to identify hernia at hatching. Possibly modifying factors influence the variation in crest size of these geese.

SUMMARY

A small breed of South African Gray Geese is described in which lateral asymmetry occurs in their plumage. Possibly this is a genetic mosaic which occurred from a gene mutation.

The ganders are predominantly white and the geese gray to grayish white in plumage colour (sexual dimorphism). In this flock several crested birds are present. It is not known if the crest in geese is also incompletely dominant as in fowls and ducks.

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ANNUAL MEETING OF THE GERMAN BRANCH OF THE WORLD'S POULTRY SCIENCE ASSOCIATION

PROFESSOR DR. H. HAVERMANN
Institut für Tierzucht und Tierfütterung, Bonn, Germany

The Annual Meeting and Conference of the German Branch of the WPSA was held on October 10th at the new built "Institut für Tierzucht und Tierfütterung" (institute of animal husbandry and nutrition) of the University of Bonn.

Acting for the diseased President of the German Branch, Professor Dr. Havermann, Dr. Schlütter welcomed the numerous, more than 100, participators. He especially saluted the referents of the Conference, the representatives of the Federal—and State—Ministry of Agriculture, the foreign guests: Mr. Ebbell, Secretary of the Swiss Branch of the WPSA, Prof. de Blieck and Director Ubbels from the Dutch Branch of the WPSA, Prof. Lützenberg and Dr. Gerriets from the Humboldt-University of the eastern part of Berlin.

As the first Referent the Minister of Agriculture of Nordrhein-Westfalen, Dr. J. Effertz, referred to the importance of the poultry industry within the agricultural production and expressed the best wishes for a successful course of the Conference with its actual papers and the possibility of an "european exchange of thought" in the branch of poultry.

The first paper was presented by Dr. Engler, Vice President of the WPSA, poultry specialist of the Food and Agriculture Organization at Rome, about "Problems of poultry breeding in the world" with a great number of excellent coloured slides.

Prof. Eriksson from Uppsala, Sweden, reported about "Modern poultry nutrition in the sight of the Swedish experiments and experiences", followed by Prof. Dr. Mehner, Director of "Bundesforschungsanstalt für Kleintierzucht" in Celle with the paper: "The importance of the production contests for breeding selection". Finally, Dr. Irmgard Gylstorff from Munich reported about: "Changes of poultry diseases among the influence of modern methods of keeping and treatment".

In the afternoon, the Conference continued with an interesting and animated discussion of the presented papers which, unfortunately had to be stopped to accomplish the provided inspection of the "Forschungsstation für Geflügelkrankheiten" (experiment station for poultry diseases) under the direction of Prof. Dr. Schürmann.

POULTRY KEEPING IN BRITAIN*

R. COLES
Ministry of Agriculture, Fisheries and Food, London, England

Today the income from eggs and poultry meat is assessed as the second most important single source in the total income from agricultural pursuits in the U.K. This situation has arisen over the post-war years and some idea of the measure of expansion which has taken place can be gained from the fact that pre-war about 71% of all hen eggs consumed in this country were home-produced; today it is virtually 100%. The rate of expansion in the poultry population of England and Wales can be seen in Table 1.

TABLE I
Poultry Population of England and Wales (in 000s)
September Returns

1940	22,816
1945	16,459
1946	17,139
1947	18,335
1948	22,899
1949	27,493
1950	31,220
1951	31,977
1952	30,761
1953	30,016
1954	32,523
1955	32,623
1956	34,965

The actual annual production of eggs since the end of the war has risen substantially more than pro rata to the increase in the poultry population. Precise figures for total egg production are not possible to obtain, but a fair appreciation of the higher rate of production can be gathered from packing station returns (Table 2). It is realised that not all eggs pass through packing stations and that over the last four years, the proportion diverted from direct sales to the packing stations has probably risen. But even if a generous allowance is made for this variation, there is no doubt of the increase in output.

A detailed study of the monthly throughput figures indicates that during the same period a change in the seasonality

* Paper presented at the Joint Meeting of the Dutch and U.K. Branches of the World's Poultry Science Association, Amsterdam, August 13th, 1957.

TABLE 2

Throughput of Hen's Eggs at Packing Stations in Great Britain—1945-56 in Boxes of 360 (000s)

1945	3,211
1946	3,709
1947	3,449
1948	5,020
1949	7,612
1950	11,373
1951	10,877
1952	11,075
1953	11,912
1954	13,882
1955	13,801
1956	15,492

of production, quite as important as the change in total production, has also taken place. Thus in 1945 in the month of April the packing stations' returns were seven times as great as those for November. In 1956 the output of any month was not significantly greater than 50% above any other, and the month of lowest output was August. These changes, together with the fact that the number of farmers owning poultry flocks has declined in the last decade, bear witness to the major developments that have occurred within the framework of the poultry industry in Britain since the end of the war. These developments mainly concern management methods and breeding.

In the war-time period and the immediate post-war year animal foodstuffs were heavily rationed. Consequently flocks were limited in size, and management systems tended to be those in which the birds could themselves scavenge and be supplied by home-grown foods. Range and fold systems predominated and virtually all moderate or larger sized flocks were to be found on general farms. The controlled price of eggs was attractive and poultry numbers increased as food rationing became easier. The end of food rationing, however, occurred a short while after the subsidies for animal foodstuffs were reduced and finally terminated. As the controlled price of eggs did not by any means fully reflect the higher cost of food the attractive margin of difference between 112 lbs. of food and 120 eggs began to disappear with marked celerity.

This rapid decline in the profitability per bird in the 1948-1953 period stimulated poultry keepers (a) to increase flock size to maintain total income, (b) to increase produc-

tion levels towards the same end, and (c) to improve production at the season of highest price. During this same period endeavours were naturally made to employ labour saving methods and systems which would reduce costs. Most of these methods, however, were effective only if used on a large scale. The sum total of these efforts was a rapid swing to intensivism particularly cage batteries, deep litter housing and, to a lesser degree, strawyards. The rapidity of this change is shown from the figures given in Table 3.

TABLE 3

(a) *Purchase of Cage Batteries by Poultry Farmers 1948-1956*

Year	*No. of Cages*
1948	270,000
1949	500,000
1950	710,000
1951	800,000
1952	520,000
1953	550,000
1954	650,000
1955	700,000
1956	710,000 (est.)

(b) *Purchase of Deep Litter housing from one manufacturer 1948-1956*

Year	*Equivalent to No. of Birds*
1948	—
1949	12,000
1950	50,000
1951	200,000
1952	330,000
1953	550,000
1954	600,000
1955	600,000
1956	580,000

The change-over to intensive methods in this country stemmed from the need to boost egg production levels and not, as in the U.S.A., to reduce labour costs, although almost immediately the reduction of labour costs began to be a matter of some importance. The trend to intensive housing resulted in both an increase in production per bird and in more even production; in consequence, the seasonal curve began to even out. But as the newer systems required replacements of stock to be made at one time, a complete clear-out of the laying flock usually occurred at the end of the laying year and the new season's pullets were housed shortly afterwards. The early summer, when this actually took place, therefore

became the period of lowest production. The alert poultryman has since endeavored to increase production at this new period of high price with some success, so smoothing out the seasonal production curve still further.

The intensive methods generally involve greater capital expenditure than the range systems. Since cost per bird is reduced as the size of the venture is increased, the trend towards large-scale undertakings received a fillip. And this tendency has been further stimulated in the last few years by the fact that most labour saving devices work efficiently only on large units. The rapidly rising wage rates have been an increasingly important consideration.

The effect of these factors has been that the recent years have seen, not only a strong trend towards intensive methods, but an equally strong swing to larger flocks. Thus in 1948 under 1% of all our flocks had over 500 adult birds or more, although this small number of flocks included over 11% of the poultry population. By 1955, however, almost 2½% of our flocks consisted of 500 adult birds or more, accounting for over 20½ of the poultry population. This swing to large flocks is still progressing with gathering speed. (Table 4).

TABLE 4

1. *Farms carrying poultry in flocks of various sizes shown as a percentage of all farms carrying poultry*

	Percentage of flock in size category as a percentage of all flocks			
Size of Flock	*1948*	*1952*	*1954*	*1955*
1—100 adult birds	85.54	77.18	74.09	71.69
101—500 adult birds	13.59	21.33	24.00	25.93
Over 500 adult birds	.87	1.49	1.91	2.38

2. *Farms carrying poultry in flocks of various sizes shown as percentage of the poultry population*

	Percentage of flocks in size category as a percentage of poultry population			
Size of Flock	*1948*	*1952*	*1954*	*1955*
1—100 adult birds	46.61	34.08	32.37	29.56
101—500 adult birds	42.22	49.92	49.28	48.91
Over 500 adult birds	11.17	16.00	18.35	21.53

The trend towards large sized poultry flocks has by no means been confined to the "traditional" specialist poultry farm of pre-war days of 10 acres or so. Indeed much of the expansion has taken place on arable farms with big acreages. This development seems to owe its being to the realisation by many farmers, who formerly despised poultry, that the hen when managed properly on "big business" lines can compare well with other forms of livestock on a profit basis, and secondly to the special advantages the large arable farmer possesses with regard to food. With cereal grains forming the bulk of poultry rations, large scale farmers are in a position

to reduce food costs by using their own home-grown grains and mixing their own foods. The capital cost of the equipment seems generally to justify this practice if the amount of food consumed is in excess of 2 tons per week. This precludes small flock owners from home-mixing and it is possible that the increasing list of nutrients now included in poultry rations would prevent home-mixing from being carried out by other than owners of large sized flocks.

It is understood that increases in flock size are not encouraged in The Netherlands and on this point it may be of interest to refer to a fundamental difference in the economy of the poultry industries of the two countries. Britain has a human population of about 55 million—or about three to four times that of Holland. Yet the number of agricultural holdings in Britain does not greatly exceed that of Holland. While it is possible for Holland to supply her home needs and export eggs from low cost small farm flocks, the very much larger human population of Britain makes this impossible. Home egg requirements can be met by the existence of a number of specialist flocks or by imports. Since the specialist flock involves costly equipment, paid labour and often food at prices in excess of that available to the small farm flock, such a unit moves out of the low cost category. Production must therefore be high to cover the higher expenses, while further expansion in size may be undertaken in an attempt to spread costs more economically.

This predicament of the specialist underlies the reason why breeding has received so much attention in Britain in post-war years. Rising costs have made it essential for the national production level—and particularly that of the large flock owner—to be raised. Undoubtedly economic considerations have led to better management, feeding, change to intensive housing and more ruthless culling and so contributed to a better national egg average rate. But the regular annual improvement reported by laying trials, in which management and feeding remain unchanged, would support the contention that the steadily increasing national average production is also partially due to better bred stock.

The estimated annual average production for adult poultry is set out in Table 5. It should be realised that this figure is obtained by dividing the total estimated output of eggs by the *average* number of fowl over six months. It will be appreciated that the latter includes males over six months old. In some countries a production figure based on the total of the 12 hen/month average figures is commonly used. If

TABLE 5
Estimated Annual Average Egg Production per bird from all adult birds on Agricultural Holdings in England and Wales

Year	*Egg Production*
1938/39	154
1945/46	123
1946/47	119
1947/48	123
1948/49	133
1949/50	142
1950/51	145
1951/52	146
1952/53	157
1953/54	165
1954/55	169
1955/56	172

this method were to be employed, the figures given in Table 5 would be substantially increased viz., the 1955/56 figure of 172 on an all adult average annual would probably be around 185 on a hen month average. The poultry to which these figures refer include *all* flocks on farms, and the yield for commercial flocks of 500 birds and upwards is probably considerably higher, possibly something of the order of 200 or more.

Undoubtedly the Government's Poultry Stock Improvement Plan has had considerable influence in raising the quality of the country's laying stock and the recently installed Progeny Testing Stations will further promote this development. But much credit must be awarded to a number of breeding organizations which are applying genetic knowledge to their breeding systems. Many of these organizations are associated with large hatchery businesses and are thus able to supply the heavy capital expenditure required and to employ the professional geneticists who are needed.

This development has resulted in an increasing number of very large scale breeding units and the results are now becoming an effective force in the industry. The rise of this type of breeding establishment has had, and is manifestly continuing to have, far-reaching effects on the pattern of poultry breeding. The success of some—though not all—of the stock bred by so called "scientific methods" and its accompanying publicity has led to a keen interest by the commercial egg producer in production records and an indifference to breed type. As a result the smaller poultry breeder whose limited numbers preclude the application of genetic knowledge on the same scale is finding conditions difficult. A number have already given up and the tendency is for breeding establishments to decrease rapidly in number and greatly increase in size and scope. Whether this trend will proceed to the lengths reported in the U.S.A. and to the extinction of

the small breeder is debatable, and it may well be that the previously mentioned Progeny Testing Stations will be the salvation of some of the small but long-established breeding farms.

Associated with the growth of the large breeding organisations has been the rise of the satellite, multiplying farm—working in close collaboration with a breeder/hatchery and supplying hatching eggs back to the parent organisation. This has had the effect of causing a number of small hatcheries to close down through heavy competition and so, in the hatchery business as in the sphere of breeding, the trend is towards fewer and larger units.

The rapid expansion observed in the field of egg production has been more than paralleled with table poultry production. The main increase in table chicken output has been with broilers and, to a lesser degree, poussin. The expansion recorded in this field can be noted from the following estimate of production for the last few years:

Year	*Number Produced* (millions)
1953/54	19
1954/55	28
1955/56	41.5
1956/57	(Prov.) 55

The rapid increase has naturally been accompanied by a reduction in price, and broilers are already offering competition with the best cuts of red meat on the basis of edible meat. The reduction in price and profit margins has led to the elimination of many smaller producers and witnessed a great expansion in the scale of operations of others.

Turkey output has about doubled itself in the last two or three years but the concentration in production units is by no means on a par with that of chicken, although the same tendencies may be observed.

As a consequence of the enlarged production of poultry meat this food is rapidly moving out of the luxury trade; but the expansion has been accompanied by a decline in farmers' prices. As in the egg production sphere there is widening recognition that lower consumer prices must be expected with the rise in output, and again, as in the field of egg production, urgent attempts are being made to improve efficiency of production so that the increasing output can be absorbed by the public at prices that offer the producer a fair profit margin. Apart from the development of "factory" methods in housing and feeding, the main and most promising line

of attack is the attempt to breed true broiler birds i.e. stock with high feed conversion, very speedy growth and improved carcase conformation. With turkeys the same approach is now being adopted but apparently with less urgency.

Encouragement is being given to these efforts in the field of breeding both for eggs and meat generally through the Government Poultry Stock Improvement Plan and specifically by the recent introduction of sections in the Plan to encourage random testing of Breeders' Grade Stock. Considerable help is also given to members of the Plan through the disease control section in an endeavor to reduce losses arising through the incidence of disease.

The characteristic pattern of all sections of the British poultry industry in recent years has been one of expansion. This expansion has been generally accompanied by lower consumer prices. It will be known that a guaranteed price for eggs is in force under the 1947 Agricultural Act. The increase in the production of eggs has resulted in a substantial rise in the amount of the egg subsidy and warnings have been given that further increases in egg production must be accompanied by improved efficiency or a change in the demand situation. At present the consumption level of eggs is about 208; that for all poultry meat is about 7 lbs. per head per annum. It may be that the recently initiated British Egg Marketing Board, set up by the Industry, will be successful in stimulating the demand for eggs. The position may also be altered by the success of the Poultry Industry in speeding up their efforts to promote the breeding of superior stock—both for eggs and meat—and greater efficiency in management. Further expansion in either Section of the Poultry Industry seems likely to be influenced very largly by the degree of success achieved in these fields and the speed with which that success is attained. That the present situation is critical is generally realised.

But no matter whether over-all contraction or expansion ensues it seems manifest that the future will see a continuation of certain characteristics viz (a) an increase in the size of many flocks both for egg production and breeding, (b) a probable reduction in the number of flocks—particularly those of small or moderate size, (c) an increase in the number of large-scale breeding establishments employing highly technical methods for both egg production and meat, and probably (d) some reduction in the number of breeding farms—predominently among the smaller ones. The future in fact appears to be one of increased specialisation.

STRUCTURE OF THE POULTRY FARMING INDUSTRY IN THE NETHERLANDS*

By J. G. TUKKER

The production in poultry farming is of outstanding importance to the economy of the Netherlands. The total production amounts to approximately 4,100 million eggs, and 50,000 tons of table poultry, representing together a total value of approximately 650 million guilders.† A high proportion of this production is intended for export. The total value of exported produce in this branch was in 1956: 470 million guilders, the share of eggs in this amount being 342 million guilders and of table poultry 93 million guilders.

Size of the Poultry Flock

Twice a year an agricultural census is carried out by the Central Bureau of Statistics, viz in May/June and in December. The figures of poultry in December show that the number of poultry in the country increased considerably during 1956.

Census on December 1	*1954*	*1955*	*1956*
Pullets (in millions)	13.0	13.2	18.0
Older laying hens (in millions)	6.0	6.0	4.5
	19.0	19.2	22.5

According to these data the number of older laying hens, kept in 1956 was 1.5 million less than in previous years, but the number of pullets increased by almost 5 million birds. Also in another way it is possible to get an idea of the number of pullets, by starting from the number of eggs set in incubators.

The number of pullets in December can roughly be put at 22.5 per cent of all eggs set in incubators in the previous season. The numbers of eggs set in incubators were as follows:

1953/1954	57.0 million
1954/1955	60.5 "
1955/1956	81.8 "
1956/1957	68.8 "

During last season there was a decrease. This is due to the low prices of eggs ruling during the previous winter and spring.

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* Paper presented at the Joint Meeting of the Dutch and United Kingdom Branches of the World's Poultry Science Association, Amsterdam, August 13th, 1957.

† £1 = 10 guilders.

Intensity Of Poultry Keeping On Farms In Relation To Their Size.

Most chickens are kept on the smaller farms on sandy soils. A very substantial fraction of the income of these small holdings originates from the sale of eggs. Apart from chickens also pigs and a few cows are kept on such farms.

Data from the Central Bureau of Statistics show the following picture with regard to the various provinces in Holland:

Province	*Number of chickens per 10 HA* (hectares) cultivated land.*
Friesland	27.7
Groningen	24.6
Drenthe	40.3
Overijssel	80.5
Guelderland	165.3
Utrecht	103.8
North Holland	49.7
South Holland	57.8
Zeeland	19.7
North Brabant	89.6
Limburg	111.9

Guelderland, Overijssel, Utrecht, North Brabant and Limburg are the provinces with large areas of sandy soils. Here the largest number of chickens are kept per unit of area. Zeeland, Groningen and Friesland are the provinces with the better soils and less chickens are kept there.

A study of the national chicken flock according to the size of farms shows that most chickens are kept on the smaller holdings:

Area of cultivated land per farm.	*Number of chickens in percentage of total.*
0 — 1 hectare	17.5
1 — 3 hectare	16.1
3 — 5 hectare	13.6
5 — 10 hectare	30.0
10 — 20 hectare	17.8
20 hectares or over	5.0

Nearly 60 per cent of all chickens are kept on farms with 1-10 hectares of cultivated land.

There are only very few specific poultry farms. The opinion prevails that such farms are not desirable, as in that case the risk is too large. Therefore it is preferred to maintain poultry farming as a branch of general farming on small holdings. Since a few years some provisions are in force, advancing the realisation of this conception. These regulations imply that 600 chickens may be kept on farms of 3-20 hectares, but no more in any case, unless a higher number of fowls were already kept on such farms before. If more than

* 1 hectare = 2.471 acres.

600 hens are kept, such a farm becomes, as it were, a specific poultry farm. The provision applying to farms up to 3 hectares provides that 200 chickens can be kept per hectare of cultivated land. On farms of over 20 hectares no more than 100 fowls must be kept. It is self evident that this rule does not apply to breeding farms.

Breeding Regulations for Poultry Farming

Since 1933 breeding regulations for poultry farming are in force in this country. The regulations differentiate between "accredited pedigree breeding farms", "licensed hatching egg producing farms", "accredited hatcheries" and "commercial poultry farms".

The division of tasks set to each of these groups at the start, have given very satisfactory results over a number of years. The pedigree breeders must maintain and improve the pure breeds. The prime material of these breeders is propagated on the farms of the licensed hatching egg producers. These farms in their turn supply the accredited hatcheries with the hatching eggs they require. The latter supply the commercial poultry farmers with chicks, intended for egg production or sometimes for the rearing of table poultry (broilers).

On January 1, 1957 there were registered:

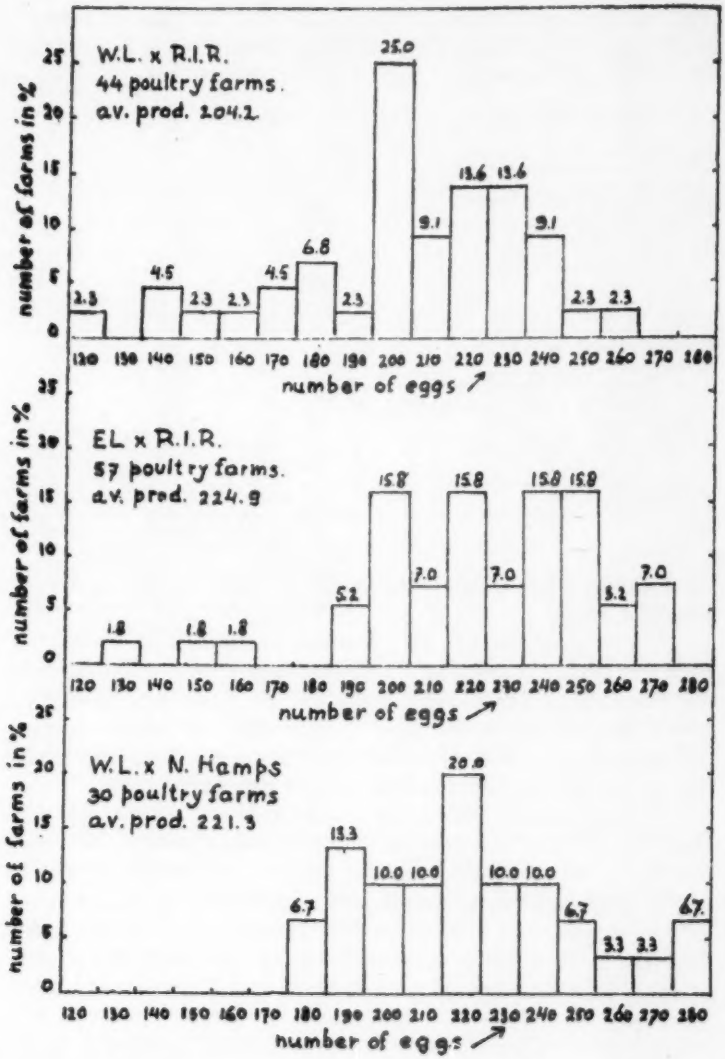
189 pedigree breeding farms,
4525 licensed hatching egg producing farms,
738 accredited hatcheries.

Survey of pedigree breeding farms, licensed producers of hatching eggs, accredited hatcheries, commercial poultry farmers.

	Breeding farms		Producers of hatching eggs		Hatcheries		Commercial* poultry farmers	
Province	No.	Av. No. of hens	No.	Av. No. of hens	No.	Hatching Capacity in thousands of eggs	No. in thousands	Av. No. of hens
Gronigen	4	637	52	443	19	392	13.8	26.3
Friesland	6	875	66	399	12	268	11.4	28.3
Drenthe	4	875	103	375	22	383	16.7	36.7
Overijssel	17	1019	640	345	83	2269	28.4	65.2
Guelderland	67	1203	1693	397	302	10179	47.8	87.6
Utrecht	11	1423	222	460	43	1713	8.5	78.9
North Holland	12	888	165	545	21	326	9.5	34.8
South Holland	8	1131	68	542	24	325	17.4	34.1
Zeeland	2	125	28	471	13	175	9.7	20.3
North Brabant	33	999	948	417	99	3090	40.4	59.1
Limburg	25	1109	540	471	100	2821	20.4	66.0
The Netherlands (average)	—	1087	—	442	—	—	—	57.4
The Netherlands (total)	189	—	4525	—	738	21941	224.0	—

* May/June census.

Distribution of the hen-housed production at 18 months of age from those poultry farms which took part in the investigation during the whole period.



Pure Breeds and Crosses

After the second world war a big change took place. Formerly only chicks of a pure breed were kept, but today crosses prevail, representing about 80 per cent of the total. This can best be judged from the number of eggs put into incubators at the hatcheries, classified according to the various breeds and crosses.

A survey of the eggs put into incubators expressed as percentage of the total input.

Pure Breeds	1938	1950/1951	1952/1953	1955/1956
White Leghorn	81	37.9	23.3	9.7
Rhode Island Red	13	19.3	13.4	7.9
Other breeds	6	8.1	3.1	1.8
Total	100	65.3	39.8	19.4

Crosses	1938	1950/1951	1952/1953	1955/1956
White Leghorn x R.I.R.	0	1.9	5.8	25.3
Exch. Leghorn x R.I.R.	0	6.1	25.2	14.1
White Leghorn x New Hampshire	0	—	0.6	13.6
Exch. Leghorn x New Hampshire	0	—	0.7	4.1
New Hampshire x R.I.R.	0	0.6	1.6	7.9
R.I.R. x New Hampshire	0	0.6	1.8	1.5
Sussex x R.I.R.	0	0.1	1.3	2.4
White Leghorn x Australorp	0	1.7	1.7	1.6
Other crosses	0	23.7	21.5	10.1
Total	0	34.7	60.2	80.6

Only chicks of a pure breed shall be kept at the pedigree breeding farms.

Crossing of breeds by licensed producers of hatching eggs has been allowed right from the beginning of the breeding regulations for poultry farming. At first very little interest was shown in this line of breeding but when, before the war, good results were obtained from it, it seemed that the crosses would become much more popular.

Almost all the poultry in the country were killed during the war. Only a nucleus of good breeding stock could be saved on the pedigree breeding farms and on those where hatching eggs were produced. From this stock on a new commercial poultry flock could rapidly become re-established. At that time the crosses came quickly to the fore. Especially crosses between cocks of a light breed and hens of a medium heavy breed came more and more in demand, year after year. The pedigree breeding farms and those licensed to produce hatching eggs have adapted themselves to the demand of the commercial poultry farmers. The change is shown in the following table.

A survey of pure breeds in percentages on pedigree breeding farms and licensed producers of hatching eggs.

	1951		1953		1956		1957	
	Breeding farms	Prod. of hatching eggs	Breeding farms	Prod. of hatching eggs	Breeding farms	Prod. of hatching eggs	Breeding farms	Prod. of hatching eggs
W.L.	64.3	55.3	39.0	26.2	25.8	15.6	24.6	13.4
R.I.R.	19.5	30.4	38.9	55.9	40.7	55.2	40.5	54.8
New Hamp.	1.7	1.3	5.1	5.9	19.1	19.8	20.6	21.8
Other breeds	14.5	13.0	17.0	12.0	14.4	9.4	14.3	10.0

The White Leghorn breed shows a substantial decrease. The breeds Rhode Island Red and New Hampshire have considerably increased in the last few years. This increase is due to the big demand for hatching eggs of the crosses with Rhode Island Red and New Hampshire hens by hatcheries.

Hatching eggs delivered per hen to the hatcheries by the licensed producers of hatching eggs.

Pure breeds:	*1953/1954*	*1954/1955*	*1955/1956*
White Leghorn	35.5	26.3	36.1
R.I.R.	40.4	33.6	49.4
Crosses:			
White Leghorn x R.I.R.	44.4	39.8	50.6
Exch. Leghorn x R.I.R.	38.6	45.5	44.9
New Hampshire x R.I.R.	52.9	41.6	51.2
White Leghorn x New Hampshire	55.5	53.2	53.7
Exch. Leghorn x New Hampshire	—	54.1	54.2
Average of all licensed producers of hatching eggs:	40.3	39.5	47.8

Results achieved with crosses

Until a few years ago little was known to the commercial poultry farmers of the utility of the different pure breeds and crosses. From an inquiry carried out at a large number of farms, where data on yield output and culls were recorded, it could be established that on the average the yield of crosses is higher than the yield of the pure breeds.

Average yield during the first laying season according to records collected over 3 seasons.

	No. of eggs up to Feb. 1	No. of eggs up to the age of 18 monthts	Ontput and culls up to the age of 18 months
White Leghorn	104	213	41.6%
Rhode Island Red	105	220	36.1%
White Leghorn x R.I.R.	115	233	35.0%
Exch. Leghorn x R.I.R.	123	244	33.0%
White Leghorn x New Hampshire	124	246	35.5%
Exch. Leghorn x New Hampshire	115	238	32.5%
New Hampshire x R.I.R.	110	224	37.3%

The yield has been calculated according to the average number of hens available. There are substantial variations in yield on the individual farms, especially on the farms keeping the same cross.

Research for the best combinations

The variations can partly be attributed to hereditable influences. This is the reason why breeders are trying to achieve further improvements by research on the field of combining ability. Of course the breeders have to take care that the original strains stay constantly in their hereditable composition. This is to certify that a certain combination with satisfying results can be made during a long period of years.

A testing station

In order to advance the building up of strains within a breed, poultry breeders established a special Association a few years ago. Its aims are:

a) To register strains,

b) To render advice on breeding to breeders,

c) The foundation of a testing station.

Today 277 strains have been registered: 88 strains of White Leghorn, 119 strains of Rhode Island Red, 49 strains of New Hampshire and 21 strains of other breeds. The testing station was founded in 1956. Some 50 different entries are tested here today on their principal properties. Yield, weight of the egg, quality of the egg, output and food consumption are the main points of research.

In co-operation with the licensed producers of hatching eggs and hatcheries, several breeders test for themselves the utility of all kinds of combinations in order to make sure that the hatcheries supply chicks to their customers complying with the highest requirements.

Only those combinations which have proved already to yield good results, will be forwarded to the testing station by the breeders. This is a matter of paramount importance as otherwise the testing station would have to be enlarged, which would give rise to financial difficulties. The larger pedigree breeders have wider scope than the smaller ones. Several smaller pedigree breeders have already decided to co-operate.

Methods of poultry farming

Apart from improvement of the hereditable influence of the poultry flock, also the methods of poultry farming have altered and have been improved.

More early hatched chicks

Year after year the prices of eggs are highest in the

autumn and winter months. In order to take advantage of this trend most poultry farmers prefer to buy their day-old chicks in January and February. The yield of pullets reared from these chicks is very satisfactory in the autumn when the prices of eggs are at their highest.

A comparative survey of the number of hatching eggs set monthly in incubators, in percentages of the total input.

	1952/1953	1953/1954	1954/1955	1955/1956	1956/1957
November	0.2	0.3	1.4	2.8	6.3
December	1.4	2 5	5.1	9.3	12.4
January	9.6	12.8	19.7	22.6	26.5
February	30.7	29.3	32.9	25.6	32.5
March	42.1	42.8	33.2	26.8	18.1
April	16 0	12.8	7.7	12.9	4.2

The extremely cold winter of 1956 was the reason why the percentage of hatching eggs set in March and April of that season were comparatively high. The eggs produced by early hatched hens in the autumn have already a reasonable weight and this is essential for reasons of marketing. Another advantage of early hatched chicks is that rearing proceeds usually much more favorable in the months of February and March than later on in the spring.

Rearing indoors, colony houses, laying houses.

Today chicks are usually put in the rearing houses without a run for about 8 weeks. Subsequently they are put in colony houses, preferably on pasture, where no chickens have been kept before. In order to prevent infection with parasites of the intestines as far as possible, on many farms the laying hens are kept permanently indoors in roomy houses with plenty of ventilation and sufficient light.

Larger laying houses

The greater part of the laying houses offer space to approximately 100 hens. Also larger laying houses are erected to-day, sometimes even for 600 hens. These larger houses are labour saving. They are particularly suitable for the deep litter method and extremely suitable for keeping the hens permanently indoors. The results attained with these houses are very favourable indeed.

Lighting

On almost all farms, be it pedigree breeding farms, licensed hatching egg producing farms or commercial poultry farms, the houses are now artificially lighted during the autumn and winter months. The day length is extended to $\pm$ 14 hours in this way.

Laying batteries

Laying batteries are only used very rarely in Holland. The capital to be invested is substantially higher than with the common methods of poultry keeping.

Culling

During the whole production season the laying flocks are regularly culled. The less productive birds are sold for slaughter. Many flocks are sold for table poultry at the end of the first laying season, but others are rigidly culled and kept on for another couple of winter months. In culling, in the sale of whole flocks and in the purchase of day-old chicks, the ruling price of eggs plays a prominent part. If the price of eggs has been good in the preceding months, more poultry is kept on and more day-old chicks are bought. Poultry keepers react in general very keenly to the conditions prevailing in their trade.

Control of diseases

The control of diseases is generally considered a matter of the utmost importance. In all provinces of the Netherlands is an Animal Health Service also occupying itself with the examination of poultry forwarded by the farmers. The poultry farmer and the veterinary surgeon attending to the farm concerned, are informed of any diseases that are found. The essential measures will be taken according to the diagnosis.

Almost all fowls are inoculated against Pox and diptheria, and a proportion of them against Newcastle Disease too. The vaccine must be ordered from the attending veterinary surgeon. The State Serum Institute at Rotterdam is in charge of the production of vaccines against Newcastle Disease. Birds can also be forwarded to the State Serum Institute for post-mortem examination. A special Health Service for Poultry relates to pedigree breeding farms, the licensed hatching egg producing farms and the hatcheries. These farms are under permanent control of the Health Service for Poultry.

Table Poultry

a) *Culled laying hens*

Owing to the rapid rejuvenation of the laying flock, the supply of chickens for slaughter is plentiful each year. In 1956 their number amounted to over 15 million. Formerly the greater part of the culls was available in the autumn. In the last few years, however, supplies are rather regular as culling is done periodically and the whole flocks are cleared also in spring and in summer.

b) *Broilers*

In addition to the yield of hens for slaughter originating from annual culling, the production of broilers has very much increased. Formerly chicks of the North Holland Blue were almost exclusively reared for this purpose. They were white flesh chickens. They were usually fed to a weight of 1.6 to 2 kgs,* all according to the demand of the buyers. Today also white flesh chicks of the crosses Sussex x New Hampshire and Sussex x Rhode Island Red are bred for fattening in addition to those of the North Holland Blue. These chickens are not reared to such heavy weight and are sold when they weigh 1.2 to 1.6 kgs. each. White flesh chickens are usually finished off at the slaughter houses in cages for 7 to 10 days prior to killing. This practice improves their quality.

For export there is a substantial demand for chickens with yellow legs, yellow flesh and white feathered. To meet this demand, cockerels of the White Plymouth Rock and Cornish breeds are used for mating with Rhode Island Red and New Hampshire. If the white in cockerels is dominant the chicks are self-evidently yellow fleshed and white feathered. Such chicks are not fed to such a heavy weight. When they weigh 1.2 kgs. they are of an excellent quality. Hens of White Plymouth Rock are sometimes mated with North Holland Blue. White-feathered, white-fleshed chicks are produced, if white is the dominant characteristic in the hens.

From May to November, where the rearing houses on the Testing station are not needed for laying birds, they are used for research on various combinations in broilers.

The total number of hatching eggs set for the home production of broilers, was 9 million in 1955 and 12.9 million in 1956. These figures give an indication of the broiler production. In 1955 16.8 million hatching eggs were set on behalf of the export of day-olds (the vast majority broilers) ; whereas in 1956 the number was 23.6 million.

The production of broilers was formerly localised in the province of North Holland, Purmerend being the centre of this trade. Later on it expanded over the whole country. Numerous commercial poultry farmers use the vacant rearing houses during summer and autumn for rearing broilers. The chicks are always bought from a hatchery, being supplied with hatching eggs by licensed producers of hatching eggs and the latter in their turn purchase the day-old chicks as well as the

* 1 kg. = 2.2 lb.

cockerels they need for the production of the hatching eggs from the pedigree breeding farms.

Duck Farming

The census of December 1956 revealed that there were 363,000 laying ducks in this country, being only about half the prewar number. Harderwijk is the centre of duck-farming in the Netherlands. Until a few years ago only laying ducks of the Khaki Campbell breed were kept. The breeders had succeeded in improving the egg-yielding capacity of this breed up to a very high level. The laying ducks kept at an ordinary egg producing farm yield approximately 330 eggs per bird in the first laying year The price made for duck eggs, however, is on the average considerably lower than the price received for hen-eggs.

The quantity of feed consumed by ducks is substantially higher than with chickens. On account of these facts the production of duck eggs is not paying so well as the production of hen eggs. Duck eggs are used in this country in rusk bakin. They are very suitable for this purpose. Furthermore they are exported.

Duck farming is practically exclusively carried on at specific duck-farms. As the keeping of ducks for the production of eggs could hardly be called remunerative of late, several of these farms changed over to the rearing of table ducks. *Peking ducks* are kept for this purpose. Young Peking ducks can be fattened in a short time, about 7-8 weeks, to a live weight of 2.5 kgs. The duck farmers at Harderwijk run a co-operative slaughterhouse. The production of table ducklings has increased considerably. This is shown by the number of hatching eggs of the Peking breed, set in incubators:—

	Number of hatching eggs
1954	386,000
1955	588,165
1956	1,058,834

The hatchability of duck eggs is approximately 65%.

Research

a) *State Poultry Institute*

The purely scientific research work in the sphere of poultry farming is carried out at the State Poultry Institute at Beekbergen.

Among others, experiments are made on housing, management, nutrition, breeding, practical genetics and hatching.

b) *Experimental Poultry Farms*

Regionally there are five experimental poultry farms in this country. Experiments are carried out which are more directly of interest to practical poultry farming.

In addition suppliers of livestock feed (co-operatively and privately run feed factories), either jointly or individually carry out investigations, in particular focused on the nutrition of poultry.

Organizations

In this country poultry farming is an integral branch of general farming. All general agricultural organizations cooperate in looking after the interests of poultry farmers in the Netherlands Poultry Federation (N.P.F.) The Netherlands Poultry Federation is recognized to-day as the representative organizations of the commerical poultry farmers, but also the pedigree breeding farms, the licensed producers of hatching eggs and the hatcheries are represented in this Federation. Apart from the Netherlands Poultry Federation there are a few other organizations of a technical character. The Netherlands Poultry-Farming Organization (N.P.O.) occupies the most prominent position among them. It consists of separate groups, viz. pedigree breeders, licensed producers of hatching eggs and commercial poultry farmers. Also the hatcheries have a technical organization of their own: the Association of Hatcheries and Pedigree Breeding Farms in the Netherlands (V.B.N.).

It is already been the intention of the Government for a long time to make the farmers themselves more and more responsible for the issue of measures affecting their trade, be it under the supervision of the Government. For that purpose specific Public Trade Corporations have been created, invested with authority to issue bye-laws. In respect of poultry and eggs the "Trade Board for Poultry and Eggs" has been established. The producers as well as the processors in this field and the various branches interested in the trade, are represented in this Board together with representativs of workers' organizations. All matters relating to poultry and eggs, involving the interests of various sections, belong to the orbit of the vertical organization: the Trade Board for Poultry and Eggs. Matters only of interest to one section are dealt with by a specific board of the section concerned. For the agricultural industry as a whole, an Agricultural Board has been created. The Poultry Farming Section of the Agricultural Board deals with matters concerning the breeding and production of poultry.

Special Boards have been established for the wholesale trade in eggs and the wholesale trade in poultry.

The costs of all these Boards have to be met by the members themselves, by taxes put on the products. The poultry farming industry does not get any subsidy or grants from the Government. The larger part of the products of poultry farming (about 60 per cent of the eggs and about 80 per cent of the table poultry) is intended for export. Consequently the prices received by the producers of eggs and table poultry are entirely dependent on the conditions obtaining on the export-markets. After all the competition with other countries will have to be kept alive. In 1955 the amount received per egg by a farmer was approximately 13.40 cents. The poultry farmer considered this price as being quite satisfactory and due to this the number of chickens increased in 1956. In 1956 the average amount received per egg was approximately 12.8 cents (about 3d), being just remunerative to the farmer. The prospects for the year 1957 were less favourable. Consequently the national poultry flock decreased with about 12.5 per cent.

Government Advisory Service for Poultry Farming

As the Government considers of the highest importance agriculture management, intending this to be as efficient as possible, they started a special poultry advisory service as a part of the Agricultural Advisory Service.

This service comprises six poultry advisory officers with about thirty assistants and one poultry adviser in general service. They work under the supervision of the Director of the Division Animal Husbandry, Ministry of Agriculture, Fisheries and Food. By community advices at lectures and meetings, writing articles, teaching at agricultural schools, running small scale experiments and by individual advice to poultry farmers, they show the farmers ways in which they can organize their enterprises as efficiently as possible. For some years all the government agriculture advisory services work together to improve agriculture in those small regions, where agriculture is less up-to-date. These methods seem to be efficient to improve the management at those enterprises.

From all the advice received from the Government Advisory Service, the Dutch poultry farmer has succeeded in putting the management of this enterprise at a high level of perfection, and as a result poultry farming has become one of the principal enterprises of Dutch agriculture.

WHERE TO HOLD THE TWELFTH WORLD'S POULTRY CONGRESS?

One of the outstanding responsibilities of the World's Poultry Science Assoiation is the holding of a World's Poultry Congress every four years. At these Congresses poultry leaders of most countries throughout the world gather together to discuss problems of mutual interest concerned with the advancement of conditions in all branches of the poultry industry.

At each Congress programmes are presented giving the most up-to-date scientific information on production, disease control, marketing and allied subjects. These programmes have always been a great stimulus to poultry leaders and the public not only in the countries in which the Congresses were held but to all other countries as well. Educational, livestock and commercial exhibits are staged by the host country and these have been particularly interesting to the thousands of producers and others attending each Congress. Commercial exhibits present the most recent inventions in the manufacture of equipment and supplies while the livestock exhibits display the popular and rare breeds of the host country.

Congresses in the past have been of immense benefit to the countries in which they have been held as well as to other countries. They have served to impress upon Government and other officials the importance of the Poultry industry as a branch of agriculture and in the national economy. In addition these Congresses have been of tremendous international significance. They have served to bring together the peoples of different countries in a common purpose and on a common ground of friendliness and understanding.

Ten Congresses have been held. Holland, Spain, Canada, England, Italy, Germany, the United States, Denmark, France and Scotland, in the order mentioned, have each held a Congress. The next, the 11th is being held in Mexico from 21st to 28th September, 1958.

Poultry leaders in countries anticipating holding the 12th World's Poultry Congress are invited to write the President of the World's Poultry Science Association, Dr. R. Coles, Min-

istry of Agriculture, Great Westminister House, Horsferry Road, London, S. W. 1., or The Secretary, Major Ian Macdougal, Agriculture House, Knightsbridge, London, S. W. 1., England.

Normally, invitations are considered at the meeting of the Council of the Associaton held during the preceding Congress. Official invitations for the Twelfth Congress should be submitted in time for that meeting to be held in Mexico in September, 1958.

Ian Macdougal
Secretary

NOTICE REGARDING ELECTIONS

In terms of Article VI (3) and (4) of the Constitution of the Association, the periods of office of the President, Vice-Presidents, Secretary and Treasurer expire at the end of 1958. The election for these offices, for the period 1st January 1959 to 31st December 1962, will take place at the Quadrennial meeting of the Council to be held on a date, yet to be fixed, between 21st and 28th September, 1958. Nominations for these offices may be made in writing by any Patron, Affiliated Body or Member of the Association.

In terms of Article VI (5), one half of the Members of Council shall be elected every four years at the Quadrennial Meetings. Nominations for the Council may be made to the Secretary in writing by any Patron, Affiliated Body, Branch Orginization or Member of the Association of the country concerned. If no nominations are received from such members, nominations may be made by any Member of the Council.

Nominations for the above offices and Membership of Council should be made in writing, addressed to the Secretary, The World's Poultry Science Association, Agriculture House, Knightsbridge, London, S. W. 1. and should be received not later than 26th July, 1958.

The following is a list of Members of Council whose period of office terminates on 31st December, 1958. They are all eligible for re-election. In order to comply with the conditions laid down in Article VI (5) some of the appointments to Membership of Council will be for four years and the others for eight years.

Australia—Mr. V. H. Brann, Mr. M. Hall, Mr. M. E. McCabe, Mr. F. N. J. Milne and A. O. Moll.

Belgium : Professor A. E. R. Willems.

Canada: Mr. G. L. Landon.

Denmark: Mr. J. Traberg.

England: Mr. J. D. Blaxland, Mr. F. Cumber, Dr. C. Horton-Smith, Dr. S. K. Kon, Mr. K. Wilson.

Finland: Professor N. Westermarck.

France: Professor G. Lesbouyries.

Germany: Dr. A. von Burgsdorff-Garath, Dr. A. Mehner.

Israel: Mr. A. Livshutz.

Japan: Mr. Jirohiko Kondo and Professor Kiyotsuna Sasaki.

Netherlands: Professor L. de Blieck.

Norway: Mr. L. Svendsen.

Scotland: Mr. J. E. Wilson.

South Africa: Prof. A. M. Gericke, Mr. M. S. Letty.

Sweden: Mr. E. Haeggblom.

U. S. A.: C. D. Carpenter, Mr. R. M. Hanson, Dr. R. G. Jaap, Dr. M. A. Jull, Mr. J. D. Sykes, Mr. D. M. Turnbull.

Switzerland: Dr. E. Hess.

Ian Macdougal
Secretary

REVIEW OF POULTRY PUBLICATIONS

Compiled by J. W. Kinghorne

1365 Iris St., N.W.

Washington 12, D.C., U.S.A.

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GENETICS

ABPLANALP, HANS. (U. California, Davis.)
GENETIC AND ENVIRONMENTAL CORRELATIONS AMONG PRODUCTION TRAITS OF POULTRY. *Poultry Sci. 36(2):* 226-228. 1957.—Heritabilities and phenotypic standard deviations were estimated for each of 4 egg production traits: age at first egg, March egg weight, winter egg number and first year egg number (excluding winter egg number). Genetic and environmental correlations were estimated for each pair of traits as well as expected direct and correlated responses to selection.—*H. Abplanalp.* (Biological Abstracts)

BEHTINA, V. G. 1955. Vlijanie metoda sparivanija kur na oplodotvorjaemostj jaic i vyvodimostj cypljat.
THE EFFECT OF METHOD OF MATING FOWLS ON EGG FERTILITY AND CHICK HATCHABILITY. *Trud. Puskin. nauc.-issled. Lab. Razved. sel.-hoz. Zivotn.*, No. 7: 70-73. From abstract in *Referat. Z., Biol.*, 1956, No. 21, No. 93261.—Groups of Leghorns were used. When each ♀ was mated with 1 ♂ related to her 77.3% of the eggs were fertile, 90.7% of the fertile eggs hatched, and av. chick weight of 1 mth. was 84.4% of that of chicks obtained by mating each ♀ with 2 ♂ ♂ unrelated to her. The corresponding figures obtained when each ♀ was mated with 1 ♂ related and 1 ♂ not related to her were 85.8, 98.5 and 93.3% resp. When each ♀ was mated with 2 ♂ ♂ unrelated to her 92.8% of the eggs were fertile and 92.3% of the fertile eggs hatched. (Animal Breeding Abstracts)

CAMPOS, A. C. 1955. (Centr. Exp. Sta., Univ. Philippines, Laguna.)
THE INDIVIDUAL PERFORMANCE OF SELECTED S.C. WHITE LEGHORN PULLETS. *Philipp. Agric., 39:* 129-132.—Apart from the introduction of 3 ♂ ♂ in 1951, the Philippine University College flock of S.C. White Leghorns has been maintained as a closed flock since 1946. In order to test whether certain distinct economic characters have become fixed and to be able to select high producing birds as possible breeders, 72 pullets were picked at random, individually caged, and their production recorded during 1952. The birds averaged 207.7 eggs each weighing 55.5 g.; 45 birds produced 200 eggs or more. Their body weight averaged 1.42 kg. at 10 mths. of age. Only 4 pullets died during

the year. These results indicate that superior birds can be selected from imported ordinary stock and give good performance under local conditions. (Animal Breeding Abstracts)

CARTER, R. D., M. G. McCARTNEY, V. D. CHAMBERLIN, and J. W. WYNE. (Ohio Agric. Expt. Sta., Wooster.)

THE EFFECT OF STORAGE TIME AND TEMPERATURE ON FERTILIZING CAPACITY OF TURKEY SEMEN. *Poultry Sci. 36(3):* 618-621. 1957.—Large White turkey females were inseminated with pooled semen stored at 10°C or 15°C for periods of 0, 2, 4 and 6 hours. Storage at 15°C gave better fertility than at 10°C, however, a sharp drop in fertility was experienced when semen was stored at either temperature for a period of only 2 hours. No significant differences was noted in hatchability of fertile eggs. It was concluded that turkey semen should be used for artificial insemination as soon as possible after collection.—*R. D. Carter.* (Biological Abstracts)

CHAMPION, L. R. 1956. 1957. (Dep. Poult. Husb., Michigan State Univ., East Lansing.)

STUDIES IN HATCHABILITY. II. THE PERFORMANCE OF TWO STRAINS OF LEGHORNS IN INTER AND INTRA-STRAIN MATINGS. III. EFFECTS OF BACKCROSSING INTER-STRAIN LEGHORNS. *Quart. Bull. Mich. agric. Exp. Sta. 39:* 321-326; 457-468. —II. Cockerels and pullets of 2 non-inbred strains of S.C. White Leghorns were used in inter and intra-strain matings. In both strains there were differences in hatchability in favour of the F_1 inter-strain hybrid embryos which were highly significant, being 3.50 and 7.11% resp.

A significant difference was shown between hatchability of the eggs from the 2 intra-strain matings. Comparable hatchabilities were obtained, however, for both lots of inter-strain embryos. From these results it would appear that the dams had little, if any, more influence on hatchability than the sires.

III. F_1 generation ♂♂ and ♀♀ from reciprocal crosses of 2 diverse strains of S.C. White Leghorns were backcrossed to pure line (A and B) ♂♂ and ♀♀ giving 8 different backcross matings in all, and the hatchability results were compared statistically. A hatchability percentage of 89.98 was obtained when one of the parents of the backcross was of A breeding v. 84.14 when one was of B breeding. When the various matings were evaluated on the pooled hatchability data, the superiority of one strain when mated to pure line birds was demonstrated. (Animal Breeding Abstracts)

CLOUGH, M., and A. G. COCK. 1957. (Poult. Res. Field Sta., Sch. Agric., Cambridge.)

VARIABILITY OF INBRED AND INCROSS CHICKENS. *Nature [Lond.], 179:* 1030-1031.—In F_1 reciprocal crosses between 2 highly inbred lines of White Leghorns the coefficients of variation in body weight at 3, 6 and 12 wks. (but not at hatching) were very much less than in chicks of the pure lines. Beyond 12 wks. of age there was a tendency for inbred variability to subside towards the F_1 level. The reduction of variability in the F_1 in respect of age at 1st egg appeared to be at least as great as in body weight between 3 and 12 wks. (Animal Breeding Abstracts)

DICKERSON, G. E. 1955. (Kimber Farms, Inc., Niles, Calif.)

GENETIC SLIPPAGE IN RESPONSE TO SELECTION FOR MULTIPLE OBJECTIVES. *Cold Spr. Harb. Symp. quant. Biol., 20:* 213-224. [B.].—Time-trends in performance of a closed population of fowls were compared with the response expected from known intra-year selection differentials and heritabilities for separate components of performance when a steady environment and independence of components are assumed. Evidence concerning environmental changes, results from crossing strains, and estimates of genetic and phenotypic correlation among components also were considered.

The results suggest that continuous deliberate and natural selection for total performance operating in a domesticated population may

be considered as the counterpart of natural selection for reproductive fitness in wild populations. In either case, an approach to a fluctuating plateau is likely although intra-environmental variability due to av. gene effects and the selection applied remain as large as ever for separate components of performance.

Such *apparent* refractory response to selection is attributed partly to inter-environmental slippage arising from an adverse environmental trend or a succession of different environments, under which genetic-environmental interaction allows genetic response to selection within an environment but makes this response partially or completely irrelevant under subsequent environments. This leads (1) to av. superiority of heterozygotes in total performance or reproductive fitness over a series of environments, but to a much lesser degree of dominance for the *net* effects of genes within the narrower range of environments of a single generation, and (2) to fluctuating rather than to stable equilibrium gene frequencies, because of irregular reversals of selection response at individual loci as the population moves from one population of environments to another. A major and sustained change in the pattern of selection applied is the equivalent of a similar major change in environment; either is likely to permit progress for a time toward a new plateau.

Intra-environmental slippage in selective response also is to be expected as a result of (1) smaller or more negative genetic than phenotypic correlations among components leading to lower heritability for total performance than for its components, as a consequence of prior selection, pleiotropy and dominance, and (2) genetic regression, from random loss of useful genes and from reverse mutation. Deviations from av. gene affects due to interaction of nonalleles are largely excluded from estimates of heritability and thus from the estimates of expected response to selection. Multiplicative gene action is indicated by the multiplicative combination of heterosis effects on components of performance in crosses between strains, breeds or inbred lines; this would tend to mask dominance in phenotypic variability within populations but magnify it in crosses between populations.—From author's summary. (Animal Breeding Abstracts)

FOMIN, A. I., and A. G. FROLOV. 1955. Opyt primenenija trehporodnogo i peremennogo skrescivanija v pticevodstve.

THE USE OF THREE-BREED AND CRISSCROSS BREEDING WITH POULTRY. *Trud. Puskin. nauc.-issled. Lab. Razved. sel.hoz. Zivotn.*, No. 7: 103-119. From abstract in *Referat. Z. Biol.*, 1956, No. 23, No. 102747.—At a hatchery and 2 poultry breeding state farms 3-breed crossbreds were obtained by using Australorp or Pervomai ♂ ♂ on the New Hampshire ♂ × Leghorn ♀ cross. Hatchability, chick survival and egg production were appreciably lower in the 3-breed than in the 2-breed progeny. These characters were also less good in progeny resulting from crisscross breeding with Leghorn ♀ ♀ and New Hampshire or Australorp ♂ ♂ and ♂ ♂ of a utility breed than in 2-breed crossbreds. (Animal Breeding Abstracts)

GOTO, —. 1955.

THE CORRELATION BETWEEN EGG WEIGHT AND HATCHING WEIGHT OF CHICKS. *Nivatori-no Kènkju, 30(4):* 39-43. [In Japanese.] From abstract in *Referat. Z., Biol.*, 1956, No. 21, No. 93256 —Eighty White Leghorn, 84 Plymouth Rock and 100 *Rokfon* eggs were used. The coefficient of correlation between egg weight and chick weight at hatching was 0.80 for the W.L.s; the relation was maintained in subsequent growth. The difference between hatching and egg weights was 17 g. for the W.L.s, 16 g. for the P.R.s and 15.1 g. for the *Rokfons*. When eggs of similar weight were compared in the 3 breeds the hatching weight of *Rokfon* chicks was the greatest. (Animal Breeding Abstracts)

HAAG, J., and L. PLACIDI. 1957. Variations saisonnières dans la fécondation des oeufs au Maroc.

SEASONAL VARIATIONS IN THE FERTILITY OF EGGS IN MOROCCO. *Rec. Méd. vét., 133:* 220-224.—The figures used in this study

represent a 6-yr. period (1949-55) during which thousands of eggs were incubated in connection with ultra-virus research work. The eggs were brought in from local farms which are representative of the general standard, where birds are on free range and get the minimum of attention. Fertility, as measured by the av. percentage of eggs which had developing embryos on the 7th day, is shown by month; it was as low as 26% in Aug., and even at its peak, in March, was no higher than 61%. Fertility was lowest in the hottest, driest mths. and at its best in Jan.-Mar. When the considerable embryo mortality in the 2nd wk. and the failure of chicks to hatch are also taken into account, it is evident that the reproductive rate of the indigenous Moroccan fowls must be extremely low.

There appeared to be no relation between the annual seasonal fertility rates and length of day. Poor nutrition is probably the most important factor. (Animal Breeding Abstracts)

HAYS, F. A. (U. Massachusetts, Amherst.)
EGG PRODUCTION AND REPRODUCTION IN YEARLING HENS THAT LACKED THE NORMAL REST PERIOD ASSOCIATED WITH THE FIRST ANNUAL MOLT. *Poult. Sci. 36(3):* 510-512. 1957.—These data include 22 superior hens that failed to exhibit the normal cessation of egg laying associated with annual molt at the close of the first laying year while the flock was open bred and 22 birds of similar character produced after the flock was closed. Closed flock breeding appeared to reduce both fertility and hatchability but did not adversely affect chick viability. There is no conclusive evidence that such hens are superior breeders but the volume of data is too limited to furnish definite information. There is some evidence that mortality in the second year may be excessive in such hens.—*F. A. Hays.* (Biological Abstracts)

HENDERSON, E. W. (Michigan State U., E. Lansing.)
INHERENT VARIATION IN INFLUENCE OF HATCHING EGG WEIGHT ON EARLY CHICK GROWTH. *Michigan State Univ. Agric. Expt. Sta. Quart. Bull. 39(3):* 393-397. 1957.—Chick weight up to the 4th week was significantly influenced by the weight of the egg from which it hatched. Samples varied in number from 24 to 35 from 5 breeds (3 standardbreds and 2 crossbreds). Egg weight-chick weight correlations were—White Leghorns: males (0.37), females (0.16); R.I.R.: males (0.45), females (0.49); B.R.: males (-.06), females (.19); D.C.X.W.L.: males (0.26), females (0.54); W.C.X.B.R.: males (-0.13), females (0.33), Sexual differences between weights of chicks were significant at the 4th week. Data indicate that all chicks in growth experiments should be individually pedigreed from eggs of known weight and ancestry before incubation.—Author. (Biological Abstracts)

JOHNSON, A. S., (Central Exptl. Farm, Ottawa, Canada), and **V. S. ASMUNDSON.**
GENETIC AND ENVIRONMENT FACTORS AFFECTING SIZE OF BODY AND BODY PARTS OF TURKEYS. I. THE HERITABILITY AND INTERRELATIONSHIPS OF BODY WEIGHT AND LIVE BODY MEASUREMENTS. *Poultry Sci. 36(2):* 296-301. 1957.—Heritability estimates for turkeys at 3 ages, 8, 16 and 24 weeks, averaged from 0.50 to 0.61 for body weight, shank length, keel length and body depth. Breast width and tibial circumference had lower heritability at 0.36 to 0.44. There was no evidence of a general change in heritability with age. Body weight was positively correlated with body measurements. There was a decline with increasing age in most of the correlations calculated. The correlations of body weight with body measurements were generally higher than those among body measurements.—*A. S. Johnson.* (Biological Abstracts)

KAEM, L. L. 1957. Sozdanie porodnoi gruppy kur—krasnye moskovskie.
THE FORMATION OF A NEW BREED GROUP OF FOWL—THE RED MOSCOW. *Pticevodstvo, 7(2):* 32-33.—Work on the forma-

tion of the new breed group was begun by fanciers in 1943. Rhode Island Reds×Faverolles were backcrossed, selected, mated *inter se* and then mated with Orlov Russian×R.I.R. crossbreds. The progeny were selected and mated *inter se*. The breed group so formed is dual-purpose. The birds are described; they have a small comb, no wattles, yellow unfeathered legs, and red plumage with light markings. In 1955 production averaged 183 eggs and in 1956 it averaged 200 eggs; av. egg weight is 60-70 g.; the hens do not go broody. The meat is of high quality and ♀♀ weigh up to 6 kg. (Animal Breeding Abstracts)

KUSNER, H. F. 1957. (Inst. Genet., Acad. Sci. U.S.S.R.) Pticevodstvo v Japonii.

POULTRY BREEDING IN JAPAN. *Pticevodstvo 7(2):* 34-40.—Of the 6,150,000 peasant-owned farms in Japan 69.8% keep poultry. In 1954 there were 42,000,000 birds, of which the majority were fowls; there were 265,000 ducks. The indigenous breeds and varieties (bantams, long-tailed, and game fowls) are of low economic value; within recent years western breeds have been imported and in 1953 White Leghorns represented 72.8%, Barred Plymouth Rocks 3.8%, Rhode Island Reds 1%, the indigenous naked fowl 3.2%, crosses 6.7%, and other breeds, including the White Plymouth Rock and New Hampshire, 12.5% of the fowl population. There are a number of commercial crosses between Leghorns and Plymouth Rock or the indigenous Naked hens, and between New Hampshires and Barred Plymouth Rocks; the most popular cross, the Rockhorn, is the result of Leghorn ♂×Barred Plymouth Rock ♀ matings. In the 1953-54 laying trials 6899 hens competed; 1006 laid over 300 eggs and these included 20% of the White Leghorn× Barred Plymouth Rock crossbreds, 16.8% of the Barred Plymouth Rocks and 14.6% of the White Leghorns. (Animal Breeding Abstracts)

LACZA, B. 1956. A magyar kendermagos baromfi.

THE HUNGARIAN BARRED FOWL. *Magy Mezog. d., 11(7):* 22. From abstract in *Referat. Z., Biol.*, 1956, No. 24, No. 107474.—The development of the Hungarian Barred breed was started at the Godollo Research Institute in 1948; it is now bred in a number of districts. The live weight of the Hungarian Barred is greater than that of the Hungarian White or Hungarian Yellow fowl; 80-90% of the birds are top grade. (Animal Breeding Abstracts)

MACUBARA, —. 1955.

THE COEFFICIENT OF CORRELATION BETWEEN THE EGG PRODUCTION OF HENS AND THAT OF THEIR DAUGHTERS. *Nivatori-no Kénkju, 30(4):* 120-126. [In Japanese.] From abstract in *Referat. Z., Biol.*, 1956. No. 22, No. 97987.—Data were obtained over 3 yrs. from the egg production of 100 dam-daughter pairs. Annual production varied between 120 and 320 eggs. The coefficient of correlation between the production of the dams and that of their daughters was 0.114. The coefficient of correlation between the weight of a hen and that of her eggs was $+0.39\pm0.041$. (Animal Breeding Abstracts)

MACUBARA, —. 1955.

MODIFICATION OF EGG WEIGHT IN RELATION TO THE BODY SIZE OF THE HEN. *J. Tokyo Soc. vet. zootech. Sci.*, 1955 *(5):* 47-49. [Japanese with English summary.] From abstract in *Referat. Z., Biol.*, 1956, No. 23, No. 102744.—The coefficient of correlation between body weight and egg weight for 82 White Leghorns was +0.486; the regression of egg weight per 100 g. body weight was 0.862 g. The hens were placed in 9 groups distinguished by body weight and by egg weight, and the av. egg weight of each group was adjusted. It is proposed to use this method in selection. (Animal Breeding Abstracts)

MASUI, K. 1956.

LONG-TAILED FOWL—JAPANESE BREEDS OF FOWL. *Exhibits int. Genet. Symp.* [*Tokyo & Kyoto*], *1956*, [*Tokyo*]: *Science Council of Japan.* Pp. 89-96.—At present there are more than 20 Japanese breeds of fowl. Among the breeds illustrated in this paper are the Zidori or

Native fowl (the oldest of the Japanese breeds, originally bred as a time-keeper), silver-grey, white and golden-brown varieties of the Onaga-dori or Long-tailed fowl (a breed which is characterised by the exceptionally long tail of the adult cock), the Syokoku (another long-tailed breed), the Kuro-kasiwa (regarded as a black variety of the Syokoku), the Totenko or "Crow-at-dawn" (also with a longish tail, but characterised by its long crow, which is of 15-20 secs. duration), the Naki-tomaru and Koye-yosi (both long-crowing breeds), the Minohiki or Boa Drooping fowl (a long-crowing breed whose saddle feathers are reminiscent of the Japanese fisherman's reed apron), the Satumadori or Kagosima fowl (a type of Game with well-developed tail and saddle feathers), the Syama (a Game breed), the Katura-tyabo or Black-tailed White Bantam, and the Uzura-tyabo or Japanese Rumpless Bantam. The salient character of most of the above breeds are indicated. Reference is also made to the Zitokko or Japanese Creeper fowl. The gene responsible for the short legs of this breed is lethal when homozygous. (Animal Breeding Abstracts)

MERAT, P. 1956. (Sta. Rech. Avicol., Jouyen-Josas, Seine-et-Oise.) L'effet de la date d'éclosion sur le résultat de la sélection pour la précocité sexuelle des volailles.

THE EFFECT OF DATE OF HATCH ON THE RESULT OF SELECTION FOR EARLY SEXUAL MATURITY IN POULTRY. *Ann. Zootech.* [*Paris*], *5:* 173-194.—Heritability of age at 1st egg was estimated for 7 generations of pullets, belonging to 2 flocks, hatched at the beginning and at the end of the spring hatching season. From a practical point of view the data indicate that for pullets born late in the season selection by sire families is possible. For pullets born early in the season selection by sire or dam families is possible or even individual selection. (Animal Breeding Abstracts)

MULLER, H., and **U. HEIDENREUTER.** 1956. (Inst. Kleintierz., Karl-Marx-Univ., Leipzig.) Durchführung und Ergebnis der ersten Entenleistungsprüfung.

RESULTS OF THE FIRST DUCK PERFORMANCE TEST. *Tierzucht, 10:* 377-378.—Duck breeding has been carried out since 1949-50 in the German Democratic Republic according to flockbook requirements, in order to meet the demand for a more efficient and rapid growing bird. A test was held in the Institute from April to July 1956; 6 breeders in the district of Dresden each supplied 50 Pekin hatching eggs. The av. number of ducklings hatched per group ranged from 28 to 44 and their av. weight from 51 to 59 g. At 2 wks. of age 20 from each group were selected for fattening. After 6 wks. all these birds reached at least 2000 g. and food conversion ranged from 4.190 to 4.379 kg. per kg. increase in body weight. During the fattening period no losses occurred and birds from all breeders were considered satisfactory. (Animal Breeding Abstracts)

NOVIK, I. E. 1957. (Inst. Genet., Acad. Sci. U.S.S.R.) O processe oplodotvorenija u kur.

THE PROCESS OF FERTILISATION IN HENS. *Z. obsc. Biol., 18:* 75-80. [English summary.]—The literature is reviewed. A series of experiments was begun in 1953. The time of ovulation was ascertained in all hens. Ova were removed by operation from donors either 5-10 mins. before or immediately after ovulation and were transferred to recipients from the ovaries of which all large and average-size follicles were removed; a total of 81 transfers was made. None of the eggs which developed from unovulated follicles was fertile either when the donor was inseminated before the transfer and the recipient was not inseminated, or when the donor was not inseminated and the recipient was inseminated. Fertile eggs developed from ovulated ova transferred from uninseminated donors to inseminated recipients, and infertile eggs from ovulated ova taken from inseminated donors and transferred to uninseminated recipients. To find when fertilisation occurred, hens which had been kept apart from cocks for 6-8 mths. were mated several times

in succession and again separated from ♂ ♂ ; they were killed at various intervals. All the spermatozoa were in the vagina 1-2 hrs. after mating, some were in the uterus 5 hrs. after mating, and they were throughout the oviduct 4-5 days after mating. After 2½ mths. spermatozoa were still noted in the oviduct. None was observed 6-8 mths. after mating. It is concluded that fertilisation occurs in the upper part of the oviduct. (Animal Breeding Abstracts)

OLIVER, M. M., B. B. BOHREN, and **V. L. ANDERSON.** (Purdue U., Lafayette, Ind.)

HERITABILITY AND SELECTION EFFICIENCY OF SEVERAL MEASURES OF EGG PRODUCTION. *Poultry Sci. 36(2):* 395-402. 1957.—Heritabilities, genetic correlations and potential genetic gains were calculated for (1) per cent egg production to January 1, (2) Number of eggs to January 1, (3) Number of eggs laid in 300 days following first recorded egg, (4) Number of eggs laid in 365 days following first recorded egg, and (5) Number of eggs laid to 500 days of age. Heritabilities of the 5 measures were approximately 0.15. Genetic correlation between (1) and (2) was about 0.30 suggesting these are estimates of different genetic parameters. (1) was consistently more highly correlated with the 3 long term estimates of production than was (2). Relative efficiencies of the 5 measures as criteria of selection for improving number of eggs to 500 days of age or number of eggs in 365 days of production showed that percent production was most efficient.—*V. L. Anderson.* (Biological Abstracts)

OSBORNE, R. 1957. (Poult. Res. Centre, Edinburgh.)

THE USE OF SIRE AND DAM FAMILY AVERAGES IN INCREASING THE EFFICIENCY OF SELECTIVE BREEDING UNDER A HIERARCHICAL MATING SYSTEM. *Heredity, 11:* 93-116. —Four methods of selection are compared with each other and with individual selection, the comparisons referring to selection of ♀♀ in a population of ♀♀, as in poultry: (*a*) Selection of complete full-sib families disregarding individual merit or classification into half-sib families. (*b*) Selection on the basis of an index with particular weights attached to full-sib family averages and to individual records. (*c*) Selection of complete sire families, each family consisting of a mixture of full- and half-sibs. (*d*) Selection on an index with particular weights attached to sire family averages, dam family averages, and individual records.

A general formula is derived, giving appropriate weighting factors for all values of heritability, and distributions of offspring by families, and these are tabulated for particular cases. Corrections are given for the orthodox expectation of gain from individual and family selection where small populations are involved.—From author's summary. (Animal Breeding Abstracts)

PAYNE, LOYAL, P. B. SIEGEL, and **LESLIE ORTMAN.** (Kansas State Coll., Manhattan.)

CORRELATION OF DAM, EGG, POULT AND ADULT WEIGHTS IN BROAD BREASTED BRONZE TURKEYS. *Poultry Sci. 36(3):* 572-575. 1957.—The average egg weight increased with body weight. Hens with an average body weight of 15.7 lb. produced eggs that averaged 82.9 g. each, while hens averaging 19 lbs. each laid eggs averaging 90.9 g. The regression coefficient of +2.058 was highly significant. For each unit (1 lb.) increase in hen weight there was a corresponding increase of 2.058 g. in egg weight. Poult weight varied with the size of egg. A difference of 7.84 g in egg size made an average difference of 4.16 g in poult size. The coefficient of regression of +0.570 was highly significant, meaning that for each unit (1 g) increase in egg weight there was a 0.570 g increase in poult weight. The percentage of poult weight to egg weight was 64.7 which was intermediate between 64% (chicks) and 66% (poults) reported by other workers. With one exception, there was no correlation between

poult weight when hatched and mature weight at 28 weeks of age.—Auth. Summ. (Biological Abstracts)

PAYNE, LOYAL, LESLIE ORTMAN, and P. B. SIEGEL. (Kansas State Coll., Manhattan.)

EARLY DETECTION OF FERTILITY IN TURKEY EGGS IN RELATION TO "SHUCK-OUTS." *Poultry Sci. 36(3)* 576-579. 1957.—Fertility of turkey eggs candled 24, 48 and 72 hours after incubation started was determined with a high degree of accuracy over a period of 2 months. There was no significant difference in percentage hatchability, percentage dead germs, or percentage shuck-outs between the 2 months (March and April). The correlation (+.03) between the detection of fertility and the incidence of shuck-outs was not significant.—Auth. summ. (Biological Abstracts)

ROONEY, W. F. (U. California, Berkeley.)

THE EFFECT OF BODY WEIGHT IN BROAD BREASTED BRONZE TURKEYS UPON FERTILITY AND HATCHABILITY. *Poultry Sci. 36(2):* 229-231. 1957.—In a flock of heavy Broad Breasted Bronze turkeys larger and smaller toms were mated with large, medium, and small hens. Six pens each containing 50 hens and 5 toms were maintained for 14 weeks of egg production. Supplementary artificial insemination was used. Approximately 11% and 16% more eggs were fertile from small hens than from medium and large hens respectively. There was no significant difference in fertility between larger and smaller toms. Hatchability of fertile eggs was essentially the same in all groups.—*W. F. Rooney.* (Biological Abstracts)

SAEKI, YUICHI. (Natl. Inst. Agric. Sci., Chiba-Shi, Japan.)

INHERITANCE OF BROODINESS IN JAPANESE NAGOYA FOWL, WITH SPECIAL REFERENCE TO SEX-LINKAGE AND NOTICE IN BREEDING PRACTICE. *Poultry Sci. 36(2):* 378-383. 1957.—Nagoyas used were of a closed flock, coefficient of inbreeding being about 23%, which showed high degree of broodiness at the beginning of the experiment. White Leghorns had been inbred three generations, coefficient of inbreeding being about 31%, and no broody signs were found throughout their life. Among the F_1s of W. Leghorn (females) X Nagoya (males) about 79% went broody, and average number of broody times per broody hen was 5.24. The corresponding values of F_1s of Nagoya (females) XW.Leghorn (males) were 33.1% and 2.51 times. These results indicate the sex-linked inheritance of broody instinct. The heritability of broodiness in Nagoyas was less than 20% with the component of variance D (h^2_d) less than S (h^2_s). These facts showed that the broody behavior did not participate in heterosis, while it may be a clue to solve the problem of sex-linkage. Coefficients of correlation between broodiness and laying performance in the F_1s were always higher than that of the purebreds significantly. The broody percentage of the F_1 females from White Leghorn sires varied by their individual. So, the males proven to produce the non-broody progenies are desirable to be used.—*Y. Saeki.* (Biological Abstracts)

SAEKI, Y., K. KONDO, K. HIMENO, H. IKOMA, T. KATSURAGI, and Y. TANABE. 1956.

PERFORMANCE OF F_1 PROGENCIES BETHEEN S.C. WHITE LEGHORNS AND JAPANESE NAGOYAS. *Bull. nat. Inst. agric. Sci.* [*Chiba*], G. No. 12: 79-93. [Japanese with English summary.]—Live weight of F_1 birds up to 35 wks. of age was equal, or slightly superior, to that of purebred Nagoyas, which were heavier than the White Leghorns; in adult F_1 birds live weight was intermediate to that of the purebreds. Mean age at 1st egg was less by approx. 30 days than that of the purebreds. Average annual egg production was 249 in the W.L. ♂ × Nagoya ♀ cross and 221 in the Nagoya ♂ × W.L. ♀ cross, the difference being highly significant. Percentage of broody birds was 79 in Nagoya ♂ × W. L. ♀ crosses *v.* 37 in the W.L. ♂ × Nagoya ♀

crosses, suggesting that a sex-linked gene was involved and that W.L. ♂♂, rather than ♀♀, should be used in the cross [*cf.* No. 1502].—From English summary. (Animal Breeding Abstracts)

SCHEINBERG, S. L. 1956. (Dep. Genet., Univ. Wisconsin, Madison.) GENETIC STUDIES OF CELLULAR ANTIGENS IN THE CHICKEN. *Genetics. 41:* 834-844.—Two independent linkage groups involving blood group genes have been found in the fowl. A recombination frequency of 5.4±4.2% has been found between M_2 and Q_1 and of 2.6±2.0% between O_3 and S_2. S_3 has been found allelic to S_2 and M_3 allelic to M_2. Reagents for 4 other antigenic substances have been obtained but the linkage relations of the responsible genes have not been determined. —Author's summary. (Animal Breeding Abstracts)

SIEGEL, PAUL BENJAMIN. (Kansas State Coll., Manhattan.) PHENOTYPIC DIFFERENCES WITHIN LATE FEATHERING CHICKS AND ESTIMATES OF HERITABILITY WITHIN EARLY FEATHERING CHICKS. *Dissertation Absts. 17(3):* 482-483. 1957. (Biological Abstracts)

SIEGEL, P. B., J. V. CRAIG, and C. D. MUELLER. (Kansas Agric. Expt. Sta., Manhattan.) HERITABILITIES, SEX DIFFERENCES, AND PHENOTYPIC CORRELATIONS FOR SIX FEATHERING CHARACTERISTCS. *Poultry Sci. 36(3):* 621-628. 1957.—Moderate (0.25-0.40) to high (0.40) heritability estimates for feather development in early feathering White Plymouth Rocks were obtained by means of a selection experiment and by intrasire regressions of offspring on their dam. Most of the genetic variation was presumably of the additive type, indicating that progress for better feather development could be made through mass selection. Sexual dimorphism, with females being better feathered than males, was found in 34 of 40 comparisons. Correlations between the characters studied indicated that chicks which feather rapidly at early ages have fewer pinfeathers at broiler age.—*P. B. Siegel.* (Biological Abstracts)

SIVICKI, B. 1956. (Serbian Inst. Anim. Breed., Zemun.) Osobine hibrida dobivenih ukrstanjem brazilijanskih plovaka s domacim plovkama. THE CHARACTERS OF HYBRIDS OBTAINED FROM BRAZILIAN DRAKES AND DOMESTIC DUCKS. *Arh. poljopr. Nauk., 9(23):* 73-84.—In Feb. 1952 four Brazilian [*?* Muscovy] drakes were put with 12 ♀ domestic ducks. Of the 82 eggs set 73.17% were fertile, all of which hatched after incubation for 28 days *v.* 33-35 days for Brazilian eggs. The body weight of day-old ducklings averaged 45 g., which was not appreciably different from that of Brazilian and 5 g. greater than that of domestic ducklings. The absolute and relative body weights of ♂♂ and ♀♀ were ascertained at monthly intervals during the first year; ♂♂ averaged 0.5 kg. greater than ♀♀. At 1 yr. body weight averaged 3345 g. for ♂♂ and 2778 g. for ♀♀. Figures are tabulated. The hybrids consumed less food per unit weight gain than the parent breeds. The carcass weight of the hybrids averaged 82% of total live weight *v.* 80% for the Brazilian. Carcass characters of ♂ hybrids and of each parent breed are tabulated. The meat is of good quality. The quality of the feathers is less good than that of the domestic ducks but better than that of Brazilian ducks. (Animal Breeding Abstracts)

STANEK, E., and F. D. BULANEK. 1957. (Minist. Agric. For., Czechoslovakia.) Pticevodstvo v Cehoslovakii. POULTRY BREEDING IN CZECHOSLOVAKIA. *Pticevodstvo, 7(4):* 20-22.—The principal breeds of fowl in Czechoslovakia are the White Leghorn, Rhode Island Red, Wyandotte, Brown Leghorn and the indigenous Bohemian fowl. They are at: (1) purely commercial farms at which hens only are kept; (2) commercial farms which supply eggs to hatcheries and at which minimum production is 130 eggs per year; (3) breeding farms at which minimum production is 150 eggs per year and which supply cocks to (2); and (4) farms at which only selected birds

are kept, the hens producing at least 175 eggs of at least 55 g. each per year. Nearly 95% of the hens in Czechoslovakia are at the first 2 types of farm. Very few turkeys are bred and these are of the Bronze and White Virginia breeds. Pekin ducks are kept; they are killed for meat at 56-70 days, when live weight is 2.3 kg. In southern districts there are White geese; they are small but fatten easily. Laying tests are conducted at 3 stations. (Animal Breeding Abstracts)

TEBB, GORDON. (U. California, Berkeley.)
INBREEDING EFFECTS CONTRARY TO THE DIRECTION OF SELECTION IN A POULTRY FLOCK. *Poultry Sci. 36(2):* 402-405. 1957.—The effect of inbreeding on production was investigated using data from a Single Comb White Leghorn flock which has been subject to continuous selection for egg-production since 1932. Of the 18 intra-generation linear regressions of mean family production on the computed family inbreeding coefficient, 14 had negative values, only two of which showed significance when tested statistically. The pooled regression for all 18 generations, however, showed a highly significant negative regression of -1.001 eggs for each percent increase in the computed coefficient of inbreeding.—*G. Tebb.* (Biological Abstracts)

THOMAS, CHARLES HILL. (N. Carolina State Coll., Raleigh.)
HERITABALITY ESTIMATES OF BODY WEIGHT, GAIN, FEED CONSUMPTION, AND FEED EFFICIENCY, AND THE GENETIC, ENVIRONMENTAL, AND PHENOTYPIC CORRELATIONS BETWEEN THESE TRAITS IN NEW HAMPSHIRE BROILERS. *Dissertation Absts. 17(3):* 483. 1957. (Biological Abstracts)

van TIENHOVEN, A., and **R. G. D. STEEL.** (Cornell U., Ithaca, New York.)
THE EFFECT OF DIFFERENT DILUENTS AND DILUTION RATES ON FERTILIZING CAPACITY OF TURKEY SEMEN. *Poultry Sci. 36(3):* 473-479. 1957.—The use of 3 different diluents for turkey semen at dilution rates of 1:1, 1:3, 1:7, and 1:15 was investigated. The milk and Tyrode solutions were superior to blood serum with respect to duration of fertility but not different with respect to fertility of the eggs set during the first 3 weeks after insemination. The Tyrode solution showed a decreased hatchability of fertile eggs set 7 weeks after the single insemination. Insemination of as little as 11.9-15.2 million spermatozoa results in fertility levels not significantly different from those obtained with undiluted or less diluted semen. The milk diluent was inferior to the Tyrode solution in supporting livability of spermatozoa under storage conditions at 50°-55°F.—*A. van Tienhoven.* (Biological Abstracts)

WATANABE, M., and **Y. SUGIMORI.** 1957. (Fac. Fish. Anim. Husb., Hiroshima Univ., Fukuyama.)
STUDIES ON THE ARTIFICIAL INSEMINATION IN DUCKS. *Zootec. e Vet., 12:* 119-124. [Italian summary.]—The Japanese Improved, or Osaka, breed was used. The technique of semen collection and insemination is described. Only one operator was required for collection, owing to the use of a special table. Insemination was carried out on 15 ♀♀ with 0.3 $cm.^3$ (the av. ejaculate volume) semen diluted 5-20 times in physiological saline. Fertilised eggs first appeared usually 40 hrs. after insemination and continued to appear for an average of 6.4 days thereafter; during this period an average of 6.1 eggs, of which 5.2 were fertile, were laid. The advantages of A.I. in duck breeding are stressed (Animal Breeding Abstracts)

PHYSIOLOGY

COOPER, D. M., (Houghton Poultry Res. Sta., Huntingdon, Eng.), and **J. G. ROWELL.**
LABORATORY PREDICTION OF THE FERTILIZING CAPACITY OF COCK SEMEN. *Poultry Sci. 36(2):* 284-285. 1957.—The semen characteristics studied in this experiment—initial pH, sperm density, live sperm density, percentage dead sperm and the reduction times of resazurin to the pink and white end points—cannot be used to differentiate between collections within cocks. By measuring any one of resazurin reduction time, initial pH or percentage dead sperm, it is possible to identify cocks whose semen has an abnormally low fertilizing capacity. The small residual variations which remain after allowing for resazurin reduction time can to some extent be explained by percentage dead sperm. Only 8 groups of cocks were used in this experiment and a larger experiment is now in progress to test these somewhat tentative conclusions.—Authors (Biological Abstracts)

FISHER, HANS, and **H. S. WEISS.** (Rutgers U., New Brunswick, N. J.)
A FURTHER NOTE ON CROP REMOVAL IN THE CHICKEN. *Poultry Sci. 36(2):* 345-346. Illus. 1957.—The effect of crop removal at one week of age was followed through in hens that had been laying for a complete season and were 18 months old. Upon post-mortem examination no new outcroppings had appeared in the place where the crop had been surgically removed. This finding is in contrast to observations made by other workers who removed the crop from mature hens. —*H. Fisher.* (Biological Abstracts)

FRIARS, G. W. (Ontario Agric. Coll., Guelph, Canada.)
THE EFFECT OF LACTIC ACID ON THE FUNCTIONAL CAPACITY OF TURKEY SEMEN IN VIVO. *Poultry Sci. 36(2):* 454-455. 1957.—Fifty cc of 2% lactic acid in tragacanth jelly gave no consistent spermicidal effect on the sperm harbored by turkey females when the treatment was injected into the oviduct. Data were obtained on 14 untreated and 14 treated turkey females.—*G. W. Friars.* (Biological Abstracts)

GLICK, BRUCE. (Mississippi State Coll., State College.)
EXPERIMENTAL MODIFICATION OF THE GROWTH OF THE BURSA OF FABRICIUS. *Poultry Sci. 36(1):* 18-23. 1957.—The effects of cortisone acetate, testosterone propionate, and caponization on the bursa of Fabricius were studied in 166 Rhode Island Reds and 72 White Leghorns. Cortisone reduced bursa size in 4- and 8-week-old Rhode Island Reds independent of this hormone's suppressing effect on body growth. However, the inhibition of bursa growth in 4-week-old Leghorns with cortisone is, in part, a reflection of the retarded body growth. Testosterone propionate significantly reduced the size of the bursa in 8-week-old Rhode Island Reds, while caponization slightly increased the weight of the bursa. A significant difference was not noted between the bursa of 4-week-old testosterone and control Rhode Island Reds. The lymphatic nature of the bursa is indicated by its reaction to cortisone.—*B. Glick.* (Biological Abstracts)

HENDLER, RICHARD W. (Natl. Heart Inst., Bethesda, Md.)
A STUDY OF CARBON DIOXIDE FIXATION IN THE HEN OVIDUCT. *Biochim. et Biophys. Acta 24(1):* 187-192. Illus. 1957.—An unknown radioactive material arises during the course of radioactive CO_2 fixation in the hen oviduct. This unknown material is very steam-volatile, becomes distributed in the alcohol region of a n-amyl alcohol-water counter-current distribution, and contains its radioactivity in a very labile form so that $C^{14}O_2$ is liberated on heating. The material appears to be interconvertible with carboxyl-labeled acetic acid. Present evidence indicates that the material may be one or more acyl derivatives of a β-keto acid, possibly acetoacetic acid.—Auth. summ. (Biological Abstracts)

KIDWELL, J. F., and E. WILLIAMS. 1956. (Univ. Nevada, Reno.)
ALLOMETRIC GROWTH OF THE DARK CORNISH FOWL. *Growth, 20:* 275-293.—Weight, body depth, keel length, tarsometatarsus length, head width and length of 83 ♂ and 101 ♀ Dark Cornish birds were measured weekly from 1 to 10 wks. of age. Logarithms of the remaining 5 measurements were plotted against keel length and tarsometatarsus length in a type of allometric analysis. It was concluded that the allometric equation was theoretically satisfactory to describe the relative growth of these dimensions. Sexual dimorphism was found for several of the relations. Based on an analysis of variance components, heritability estimates of "a" and "K", parameters of the allometric equation, were generally low. (Animal Breeding Abstracts)

KOTULA, ANTHONY W., EDWIN E. DREWNIAK, and LYLE L. DAVIS. (U. S. Dept. Agric., Beltsville, Maryland.)
EFFECT OF CARBON DIOXIDE IMMOBILIZATION ON THE BLEEDING OF CHICKENS. *Poultry Sci. 36(3):* 585-589. Illus. 1957.—The comparative bleeding rates of broiler chickens immobilized in a specially constructed chamber were investigated. After 30 seconds bleeding, male and female chickens immobilized by exposure in a 33-36% CO_2 atmosphere for 75 seconds lost a significantly greater percentage of their body weight as blood than did the non-immobilized male and female birds. After 3-minute bleeding the amounts of blood lost by CO_2 immobilized male and female birds were greater than the amounts lost by the control birds but this difference was not significant. The rate of bleeding in 30 seconds and the total amount of blood lost in 3 minutes was not significantly affected by the sex of the broilers. Heavy chickens lost a smaller percentage of body weight through bleeding than did lighter weight birds. (Biological Abstracts)

McCARTNEY, M. G., R. D. CARTER, J. W. WYNE, and V. D. CHAMBERLIN. 1957. (Dep. Poultry Sci., Ohio Agric. Exp. Sta., Wooster.)
OVIDUCT AND OVIDUCAL ORIFICE DUPLICATION IN THE TURKEY FEMALE. *Vet. Med., 52:* 145-146.—Three ♀♀ in a group of 249 Large White turkeys of the same strain were found at the time of routine A.I. to have duplication of the oviducal orifices. Post mortem examination showed that the right oviducts in 2 of the ♀♀ were rudimentary, approx. 5 cm. in length. The 3rd had a well-developed right oviduct, although only 75% of the length of the left one. The magnum of this right oviduct was seen to be capable of albumen secretion, but no further evidence was found to show if it was definitely functional. There was no duplication of the ovary in any of the birds. (Animal Breeding Abstracts)

MEDWAY, W., and M. R. KARE.
WATER METABOLISM OF THE DOMESTIC FOWL FROM HATCHING TO MATURITY. *Amer. Jour. Physiol. 190(1):* 139-141. 1957.—The total evaporative water loss, total body water by the direct method and the basal metabolic rate were determined on domestic fowl at various stages of growth. The trials were conducted on a total of 440 birds. The combined respiratory and cutaneous water loss was high on the 1st day of life, dropped to a minimum between 1 and 2 weeks of age, rose sharply at 2-4 weeks of age, then gradually tapered off to the value observed in the adult. The total body water and the total body water on a fat-free basis was quite high on the 1st day of life, then gradually decreased to that of the adult. The basal metabolic rate was low on the 1st day, rose sharply to a maximum at 2-4 weeks of age and then gradually tapered off to that of the adult.—Authors. (Biological Abstracts)

OKAMOTO, S., T. OTSUBO, K. OGAWA, and S. MASUMITSU, 1956. (Fac. Agric., Kagoshima Univ.)
STUDIES ON THE HEAT TOLERANCE IN THE FARM ANIMALS. VII. THE SIGNIFICANCE OF PLUMAGE COLOUR IN THE HEAT TOLERANCE OF THE FOWL. *Jap. J. zootech. Sci., 27:* 203-210. [Japanese with English summary.]—In order to ascertain the

effect of plumage colour on heat tolerance in the fowl, changes in rectal temp., respiration rate, heart rate, and skin temps. as a result of direct summer sunlight were compared in White Leghorns and Rhode Island Reds, and in White Leghorns experimentally coloured to imitate R.I.R.s. The normally-coloured W.L. fowls appeared to tolerate the strong sunlight better than did the other 2 groups. Their better heat tolerance was probably due mainly to their white plumage colour, although it is possible that other factors were also involved, since the rectal, and some of the skin temps. taken at 26-30.5°C. in the shade were likewise lower in W.L.s than in the R.I.R.s. (Animal Breeding Abstracts)

RODNAN, GERALD P., FRANKLIN G. EBAUGH, Jr., and M. R. SPIVEY FOX.

THE LIFE SPAN OF THE RED BLOOD CELL AND RED BLOOD CELL VOLUME IN THE CHICKEN, PIGEON AND DUCK AS ESTIMATED BY THE USE OF $Na_2Cr^{51}O_4$ WITH OBSERVATION OF RED CELL TURNOVER RATE IN THE MAMMAL, BIRD AND REPTILE. *Blood, Jour. Hematol. 12(4):* 355-366. Illus. 1957.—Using the time of disappearance of circulating activity, the maximum life span of chicken erythrocytes was calculated as 35 days, pigeon, 35-45 days and ducks, 42 days. With this technique, the total red blood cell volume was 17-24 ml/kg of body weight in the rooster, 9-12 in the hen, 25-31 in the duck and 31-34 in the pigeon.—*R. Isaacs.* (Biological Abstracts)

SMETNEV, S. I., and L. G. TARABRINA. 1956. Osobennosti v morfologiceskom stroenii i himiceskom sostave jaic kur-molodok raznoi produktivnosti.

CHARACTERISTICS IN THE MORPHOLOGICAL STRUCTURE AND CHEMICAL COMPOSITION OF EGGS OF PULLETS OF DIFFERENT PRODUCTIVITY. *Izv. Timirjazev. sel.-hoz. Akad.*, 1956 *(3):* 211-214.—Between Dec. 1953 and Oct. 1954 eggs were analysed of high- and average-producing Russian White pullets at the State Farm Gorki II. An increase in egg weight paralleled an increase in body weight; the former was due to absolute and relative increases in yolk weight which were greater in eggs of the high-producing group. Eggs of the high-producers had a lower albumen content but greater albumen density, lower carotene and vitamin A contents, and thinner and more porous shells. Differences in the characters studied are also shown for each season of the year. (Animal Breeding Abstracts)

SONDERGAARD, EBBE, INGE PRANGE, HENRIK DAM, and ERNA CHRISTENSEN. (Univ. Psychiatric Lab., Copenhagen.)

URICEMIA AND KIDNEY DAMAGE IN GALACTOSE- POISONED CHICKS. *Acta. Pathol. et Microbiol. Scand. 40(4):* 303-308. 1957.—A continuation of studies of the toxic effects of high galactose diets in chicks. Ataxia, tremors, convulsions and loss of weight were common symptoms, with a significant elevation in blood uric acid. The kidneys showed cell degeneration in the tubuli and glomeruli. Histological examinations of liver, muscles, heart, kidneys, brain, spinal cord and peripheral nerves were made. No evidence for convulsions was found in the examinations of the brain and spinal cord. Substitution of cornstarch for galactose in the diet after 7 days gave a return to normal conditions of growth, behavior and blood uric acid.—K. Riess. (Biological Abstracts)

VANSTONE, W. E., W. F. OLIVER, W. A. MAW, and R. H. COMMON.

OBSERVATIONS ON THE PHYSIOLOGICAL HALF-LIFE OF SERUM PROTEINS IN THE COCKEREL AND THE LAYING PULLET. *Canad. J. Biochem. Physiol.*, 1957, *35*, 281-291. [Fac. Agric. McGill Univ., Macdonald Coll., Que.]—After administration of methionine-^{35}S by mouth to 2 cockerels the half-lives of both serum albumin and globulin were calculated to be 6.5 days. In a laying pullet the half-lives were 8.5 and 4.6 days, respectively. Activity of yolk protein was maximum 6 days after methionine had been given and thereafter declined

logarithmically with time. A second pullet stopped laying the day after receiving methionine. A phosphoprotein fraction in the blood (see Abst. 3199, Vol. 24) rose until the fourth day and then declined rapidly. The rate of replacement of serum proteins was calculated for the cockerels and the laying pullet. (Nutrition Abstracts and Reviews)

ZNOJILOVA, V. 1956. (Agric. Inst. Brno.) Vyskyt krevnich skvrn ve vejcich.
THE INCIDENCE OF BLOOD SPOTS IN EGGS. *Sborn. csl. Akad. Zemed. Ved. Zivoc. Vyr., 29:* 975-984. [Russian, English and German summaries.]—In the laying seasons 1951-54 a total of 5500 eggs of 4 breeds was analysed. There were blood spots in 7.36% of the eggs; 14.29% of the Rhode Island Red, 10.44% of the Wyandotte, 5.52% of the Brown Leghorn and 3.13% of the White Leghorn eggs were affected. There was a negative correlation, which was not significant, between the incidence of blood spots and shell thickness ($r = -0.36$). Coefficients of correlation between blood spots and the albumen index were —0.38 for the R.I.R., —0.20 for the Wyandotte, +0.79 for the White Leghorn and +0.92 for the Brown Leghorn eggs; only the last 2 were statistically signficant. (Animal Breeding Abstracts)

NUTRITION

ABBOTT, ORKA JONES. (U. Wisconsin, Madison.)
EFFECTS OF ARSANILIC ACID AND CERTAIN ANTIBIOTICS ON CHICK GROWTH. *Dissertation Absts. 16(11):* 1979. 1956. (Biological Abstracts)

ALLRED, JOHN B., LEO S. JENSEN, and **JAMES McGINNIS.** (State Coll. Washington, Pullman.)
FACTORS AFFECTING THE RESPONSE OF CHICKS AND POULTS TO FEED PELLETING. *Poultry Sci. 36(3):* 517-523. 1957. —The effect of tallow supplementation and increased protein level on the pelleting response was studied. The effect of feeding reground pellets was also observed. Dietary fat and protein level had no significant effect on the amount of response to feed pelleting. A growth response and increased feed efficiency was obtained to pelleting, even when the pellets were reground to a particle size similar to the original mash. This evidence indicates that pelleting brings about some type of change additional to the change in ration density. The possibility for a chemical change occurring during pelleting is discussed.—*J. B. Allred.* (Biological Abstracts)

ALMQUIST, H. J. (The Grange Co., Modesto, Calif.)
VITAMIN RESERVE, INTAKE AND DEFICIENCY STATES IN THE YOUNG CHICK. *World's Poultry Sci. Jour. 12(1):* 4-9. 1956. —Data are summarized graphically indicating that the total of unused vitamin reserves plus unused residue from the diet are at a minimum at between 2 and 3 weeks (using an otherwise adequate diet). Hence deficiency states are most likely to become apparent then, and delayed feeding of baby chicks is inadvisable.—*J. B. Christiansen.* (Biological Abstracts)

ANDERSON, C. F. and M. D. JONES.
RAISING "GRILLERS" (COCKERELS) FROM DAY-OLD TO TWELVE WEEKS. *J. Dept. Agric. S. Austral.,* 1957, *60,* 304-309. [Parafield Poultry Stat.]—Cockerels of both light and heavy breeds were successfully fattened as table birds of 3 lb. liveweight at 12 weeks old. Implantation of a caponising hormone increased rate of gain and reduced the age when the birds reached market weight. In one trial the chickens were removed from the brooder at 3 weeks of age, and fattened in confined weaning batteries. Debeaking was necessary to prevent serious feather-picking. The efficiency of feed utilisation was 4.57 lb.

feed per lb. gain. In a second trial confined birds ate 3.13 lb. compared with 4.29 lb. eaten by birds in pens and runs with open space; the rate of growth was the same in both. Vitamins A and D_3 in powder form could replace green feed. In Australia the term "griller" is preferred to the American "broiler" for this type of bird. (Nutrition Abstracts and Reviews)

ARSCOTT, G. H., P. H. WESWIG, and J. R. SCHUBERT. (Oregon State Coll., Corvallis.)
MULTIPLE NATURE OF CHICK GROWTH RESPONSES TO FRACTIONS OF DRIED EGG YOLK. *Poultry Sci. 36(3):* 513-516. 1957.—Four replicated experiments were conducted with New Hampshire x White Rock crossbred male chicks fed a sucrose-soybean meal ration. When a dried egg yolk preparation was extracted with ethanol evidence was obtained indicating egg yolk contains at least two unidentified growth factors when measured on the basis of plateaued growth responses and reconstitution of fractions.—*G. H. Arscott.* (Biological Abstracts)

BABCOCK, M. J. and **M. W. TAYLOR.** (Rutgers U., New Bruswick, N. J.)
EFFECT OF MEPROBAMATE ON GROWTH AND FEED EFFICIENCY OF CHICKENS. *Poultry Sci. 36(3): 485-487.* 1957.—White Leghorn cockerels 8-days-old were fed the tranquillizing drug, meprobamate, at levels up to 2.2% of the diet for 7 weeks. Significant growth retardation during the first 3 weeks was noted at 0.6% and higher levels. Decreased feed efficiency was seen at the 2.2% level. There was no apparent effect on activity or behavior.—Auth. summ. (Biological Abstracts)

BALDINI, J. T., and **HANS R. ROSENBERG.** (E. I. du Pont de Nemours and Co., Newark, Delaware.)
THE EFFECT OF CALORIE SOURCE IN A CHICK DIET ON GROWTH, FEED UTILIZATION, AND BODY COMPOSITION. *Poultry Sci. 36(2):* 432-435. 1957.—Fat and carbohydrate were compared as sources of calories in two 4-week battery tests in which 3 and 6 replicate groups of New Hampshire male chicks were used in each treatment. By using fat, glucose or corn, and cellulose in practical type diets, it was possible to compare diets having the same amount of calories of productive energy but differing in fat content by 4% and also to compare diets having the same fat content but differing in caloric value by 100 Calories of productive energy. The nutritional effect of fat in a chick diet after the need for essential fatty acids is met, is due to the caloric value of fat. An increase in the fat content of a diet without an increase in caloric value of the diet has no significant effect on growth, feed efficiency, feed consumption, or body composition.—*J. T. Baldini.* (Biological Abstracts)

BARNETT, BOBBY DALE. (U. Wisconsin, Madison.)
DIETARY FACTORS AFFECTING GROWTH OF CHICKS AND TURKEY POULTS. *Dissertation Absts. 17(3):* 460-461. 1957. (Biological Abstracts)

BARNETT, R. D., and **H. R. BIRD.** (U. Wisconsin, Madison.)
STANDARDIZATION OF ASSAY FOR UNIDENTIFIED GROWTH FACTORS. *Poultry Sci. 35(3):* 705-710. 1956—The chick response to sources of unknown growth factors was lost after an extended period of good responses. Attempts made to regain the response by applying stress to the birds by feeding various hormones, altering the protein level or holding birds for extended periods without feed and water failed. Feces from older birds reared on built-up litter were fed for 2 weeks at 1% of the diet and growth was depressed. Responses to fish solubles were obtained only in contaminated groups when this procedure was begun. After several experiments basal growth was not reduced by contamination and responses were obtained without adding feces. Chlortetracycline at the rate of 200 mg/kg greatly reduced or

eliminated the response to fish solubles. In 3 of 4 trials depleted chicks responded to a greater degree than did non-depleted chicks. The loss of response and its subsequent reappearance may be due to changes in microbial population of the environment. Certain organisms appeared necessary for the response to unknown growth factors. The feeding of antibiotics and maintenance of unusually clean quarters appeared unfavorable to their propagation.—*B. D. Barnett.* (Biological Abstracts)

BARNETT, B. D., D. J. RICHEY, and C. L. MORGAN. (South Carolina Agric. Expt. Sta., Clemson.)
THE EFFECT OF BETA-AMINOPROPIONITRILE ON REPRODUCTION OF CHICKENS. *Proc. Soc. Exptl. Biol. and Med. 95(1):* 101-104. Illus. 1957.—Mono-beta-aminopropionitrile-fumarate (BAPN) at 0.03% and 0.06% of the diet of laying hens markedly reduced egg production and caused a high incidence of soft shelled and malformed eggs. BAPN at 0.01% did not affect egg production or shell formation but reduced hatchabality slightly. Hatchability was reduced to 0 in 3 and 4 weeks when birds received 0.06% and 0.03% BAPN respectively, and hemorrhages were observed in 40 to 80% of the dead embryos. Following the removal of BAPN, production and hatchability increased and the number of soft shelled eggs decreased.—*B. D. Barnett.* (Biological Abstracts)

COLES, R.
FURTHER STUDIES ON FISHMEAL AND THE HATCHING RATES OF HEN'S EGGS. *J. Agric. Sci.*, 1957. *49*, 95-99. [Minist. Agric. Fish. Food.]—Four samples of fishmeal, A, B, C and D, were obtained from 4 different countries and included at a level of 10 per cent in the breeding ration of Brown and White Leghorn pullets. Egg production was not affected by any of the fishmeals, but with sample D the hatchability of fertile eggs was only 60 per cent as compared with 75 for sample C and about 84 for samples A and B. Bacterial examination of the fishmeals showed that the reduction in hatchability was not related to infection of the yolk sac by aerobic sporing bacilli, but that hatchability was inversely related to the depth of brown colouration. It is suggested that overheating during processing causes browning of the meal, degradation of the proteins and production of toxic substances which cause a high embryonic mortality, particularly during the last 4 days of incubation. (Nutrition Abstracts and Reviews)

CREECH, B. G. (Texas Agric. and Mechanical Coll., College Station), and **J. R. COUCH.**
THE PERFORMANCE OF LAYING HENS AS AFFECTED BY CONTINUAL FEEDING OF STREPTOMYCIN AND PENICILLIN AT HIGH LEVELS. *Poultry Sci. 36(2):* 452-453. 1957.—The effect of supplementation of penicillin, strepomycin and a combination of these antibiotics, to the diet of Single Comb White Leghorn pullets maintained on litter was determined. Results indicated that increases in egg production and improvements in feed efficiency can be obtained from feeding either antibiotic at high levels, providing that neither one had been included in the diet immediately prior to supplementation at a high level. Supplementation of these two antibiotics in combination produced responses larger than the response to either substance alone.—Auth. summ. (Biological Abstracts)

COOPER, D. M. (Houghton Poul. Res. Sta., Houghton, Huntingdon, Eng.), and **G. SKULSKI.**
EFFECTS OF FEEDING FURAZOLIDONE TO FOWLS. I. EFFECT ON BODY WEIGHT AND SEXUAL DEVELOPMENT IN COCKERELS. *Jour. Comp. Path. and Therap. 66(4):* 299-311. 1956.—The drug was fed continuously to S.C.W.L. male chicks from day-old to maturity and to males 6-18 weeks of age at levels of 0.005 to 0.02%. It was fed at levels of 0.04 to 0.08% to 5-week-old males for 14 days and to mature males for 21 days. The low levels had no effect on comb and wattle growth but had an effect on testicular development. When large

doses were fed both testes weight and secondary sexual characteristics were suppressed.—*W. B. Bell.* (Biological Abstracts)

COOPER, D. M. (Houghton Poul. Res. Sta., Houghton, Huntingdon, Eng.) EFFECTS OF FEEDING FURAZOLIDONE TO FOWLS. II. EFFECT ON EGG PRODUCTION, FERTILITY AND HATCHABILITY OF LOW LEVEL FEEDING TO PULLETS. *Jour. Comp. Path. and Therap. 66(4):* 312-316. 1956.—The drug, fed to S.C.W.L. pullets at levels of 0, 0.01, 0.015, 0.02% during the period of 14 to 26 weeks of age, had no significant effect on body weight feed consumption, date of first egg, or egg production. Fertility and hatchability were not adversely affected when untreated cockerels were used.—*W. B. Bell.* (Biological Abstracts)

DAVIDSON, J.
HOME-GROWN FEEDS FOR POULTRY. Scottish Agric. *36(4):* 184-186. 1957.—Details are given of the percentages of protein which should be in feeding materials according to the age of bird, natural feed versus artificial feed, and availability of energy supplying rations of carbohydrate nature. Merits of different types of feeds, e.g. Millers' offals, are discussed, while the value of vitamins, etc. are also mentioned. —*C. E. Foister.* (Biological Abstracts)

DAVIDSON, J., I. McDONALD, and R. B. WILLIAMS.
THE UTILIZATION OF DIETARY ENERGY BY POULTRY. 1. A STUDY OF THE ALGEBRAIC METHOD FOR DETERMINING THE PRODUCTIVE ENERGY OF POULTRY FEEDS. *J. Sci. Food Agric.*, 1957, *8*, 173-182. [Rowett Res. Inst., Bucksburn, Aberdeenshire.] —1. The algebraic method devised by Fraps for estimating the productive energy of rations was tested in 3 experiments with chicks. There was very poor replication of results, and the estimates of productive energy were considerably lower than values based on the proximate analyses of the feedingstuffs.

A fourth experiment was made to test some of the assumptions of the algebraic method, in particular, that requirement for maintenance is proportional to liveweight irrespective of the level of feeding and that a steady rate of fat and flesh gain is made from the beginning by chicks on the levels of feeding employed. Neither assumption was justified. It is concluded that the results obtained by the algebraic method are unreliable. (Nutrition Abstracts and Reviews)

FISHER, H., D. JOHNSON (JR.), and S. FERDO.
THE UTILIZATION OF RAW SOYBEAN MEAL PROTEIN FOR EGG PRODUCTION IN THE CHICKEN. *J. Nutrition*, 1957, *61*, 611-621. [Dept. Poultry Husb., Rutgers Univ., New Brunswick, N. J.]—When hens were given a semi-synthetic ration containing liberal amounts of vitamin B_{12} and methionine, raw or heated soya bean meal to provide 15 per cent protein allowed equally good egg production in a 4-week period, and feed consumption was not affected. Raw soya bean inhibited growth of chicks, where in similar conditions heated soya bean did not, at protein levels from 20 to 26 per cent. In another experiment raw and heated soya bean meals were given to supply 12.2, 15 or 30 per cent crude protein, and the effect of excluding and of including vitamin B_{12} was studied also. Adequate methionine was included in all rations. In the absence of vitamin B_{12} egg production was less on raw soya bean, particularly at the lowest protein level.

In the last trial 0, 0.1 or 0.2 per cent DL-methionine was added to rations with 15 per cent crude protein from heated or raw soya bean meal. A group of hens also got 0.05 per cent of a crude trypsin inhibitor from soya bean, no methionine, and heated soya bean meal. The methionine supplements did not give such good egg production with raw soya bean meal as with heated meal, and it was assumed that the levels were too low. The crude inhibitor did not affect egg production. (Nutrition Abstracts and Reviews)

FISHER, HANS, and **DEWEY JOHNSON, JR.** (Rutgers U., New Brunswick, N. J.)
AN IMPROVED FREE AMINO ACID DIET FOR GROWING CHICKS. *Poultry Sci. 36(2):* 444-445. 1957.—A free amino acid diet was devised on which good growth is obtained. This diet differs from previous unsuccessful diets in its much higher energy content and the inclusion of an antiacid compound. Furthermore, it contains only one non-essential amino acid—tyrosine, in contrast to older diets. The success of this diet illustrates the great synthetic capacity of the growing chick for the non-essential amino acids.—*H. Fisher* (Biological Abstracts)

FRY, RAMON E., JOHN B. ALLRED, LEO S. JENSEN, and **JAMES McGINNIS.** (State Coll. Washington, Pullman.)
INFLUENCE OF WATER-TREATMENT ON NUTRITIONAL VALUE OF BARLEY. *Proc. Soc. Exptl. Biol. and Med. 95(2):* 249-251. 1957.—A simple water treatment of pearled barley consisting of wetting the ground grain with an equal weight of water and allowing it to stand for approximately 8 hours before drying at 70°C significantly improved its nutritional value for chicks. Treated barley was equivalent to corn in supporting chick growth and significantly better than corn in terms of feed utilization.—Authors (Biological Abstracts)

GORRES, F. Vom Aufziehen und Mästen in Batterien.
REARING AND FATTENING IN BATTERIES. *Deutsch. Wirtschaftsgeflügelzucht,* 1957, *9,* 322-323. [Thalexweiler.]—The feed mixture recommended for battery chicks up to 7 weeks of age consisted of, per cent, wheatmeal 25, maizemeal 22, oatmeal 8, barleymeal 8, fishmeal 8, meatmeal 5, soya bean oilmeal 5, wheat bran 4, middlings 4, buttermilk powder 2, skimmed milk powder 2, yeast 1.5, calcium phosphate 1.0, calcium carbonate 1.0, cooking salt 0.5, oil or fat 1.5 and cod liver oil 1.5. Corresponding percentages for the mixture recommended for battery birds over 7 weeks of age were 35, 15, 10, 6, 3, 9, 6, 2, 2, 3, 1.0, 1.5, 1.0, 1.0, 0.5 and 4.0. No cod liver oil was given in this second ration.
The battery room and installations are described. (Nutrition Abstracts and Reviews)

HARMS, R. H., and **O. E. GOFF.** (U. Tennessee, Knoxville.)
FEATHER MEAL IN HEN NUTRITION. *Poultry Sci. 36(2):* 358-361. 1957.—Single Comb White Leghorn pullets were used to evaluate the use of friable feather meal, poultry by-products meal, and meat scraps as a source of protein. Data indicated that friable feather meal contains an unidentified factor which is necessary for normal hatchability of eggs from hens fed a corn-soybean oil meal-alfalfa meal type diet. Egg production or feed efficiency was not appreciably affected by either of the 3 supplemental sources of protein.—*R. H. Harms.* (Biological Abstracts)

HARMS, R. H., H. J. HOCHREICH, and **B. H. MEYER.** (U. Tennessee, Knoxville.)
THE EFFECT OF FEEDING THREE ENERGY LEVELS UPON DRESSING PERCENTAGES AND COOKING LOSSES OF WHITE ROCK BROILER-FRYERS. *Poultry Sci. 36(2):* 420-422. 1957.—Dressing losses were determined for 180 White Rock broiler-fryers which had been fed 3 energy levels for a 10-week growing period. Cooking losses were determined for 30 of these birds. By increasing the energy of the diet a significant increase was obtained in the per cent eviscerated yield. Upon broiling, the birds receiving a diet containing added stabilized yellow grease had a greater percentage of drippings than did the birds receiving no added fat in the diet. Cooking losses due to evaporation were lower when the birds were fed a diet containing animal fat.—*R. H. Harms.* (Biological Abstracts)

HEYWANG, BURT W. (U. S. Dept. Agric., Glendale, Arizona.)
THE EFFECT OF HIGH LEVELS OF ANTIBIOTICS ON THE GROWTH OF CHICKENS DURING HOT WEATHER. *Poultry Sci. 36(2):* 335-337. 1957.—In a series of experiments conducted during hot

weather, New Hampsire or Indian River chicks were fed until they were 6 weeks old, an all-mash diet or that diet supplemented with antibiotics. The supplements and their level per ton of diet were: 4 g procaine penicillin G, or 15, 50, or 100 g of chlortetracycline or oxytetracycline, or a combination of 1 g procaine penicillin G and 3¾ g chlortetracycline or oxytetracycline. The chicks were confined on straw litter in houses or on wire floors in battery brooders which had been used for several years. Mortality was low in all groups. Average chick weight and efficiency of diet utilization were as high when the combinations of low levels of the antibiotics were fed as when any of the much higher levels of a single antibioitc was fed. Antibiotics had no appreciable effect on diet consumption. *B. W. Heywang.* (Biological Abstracts)

HIROE, K., J. MASAKI, K. MOGI and **T. HOSODA.**
BIOCHEMICAL STUDIES ON EGG PRODUCTION IN THE FOWL. 2. EFFECT OF STARVATION ON THE LEVEL OF SERUM PHOSPHORUS IN LAYING HENS AND THE EFFECT OF GONADOTROPHIC HORMONE ON THE INDIVIDUAL FRACTION OF SERUM PHOSPHORUS IN FASTING HENS. *Bull. Nat. Inst. Agric. Sci., Japan* [*G*], 1956, No. 12, 195-202. In Japanese: English summary—2. Laying hens were starved for 7 to 9 days and changes in serum P fractions were studied. There was no change in acid-soluble P, lipoid P fell and nucleic acid P and protein P disappeared. When follicle-stimulating hormones were given to the starved hens blood P fractions were similar to those for normal unstarved laying hens. When luteinising hormones were given to the starved hens, horse gonadotropin had the same effect as the follicle-stimulating hormones but human chorionic gonadotropin reversed this effect and the blood P fractions were similar to those for untreated starved hens. (Nutrition Abstracts and Reviews)

HOCHRIECH, H. J., C. R. DOUGLAS, and **R. H. HARMS.** (U. Tennessee, Knoxville.)
THE EFFECT OF SUDDENLY CHANGING THE CALORIE-PROTEIN RATIO IN FEED UPON EGG PRODUCTION. *Poultry Sci. 36(2):* 447-448. 1957.—Single Comb White Leghorn pullets in approximately 75% production were used to test the effect of suddenly changing te Calorie-protein ratio in feed upon egg production. These changes included a 1.3% increase or decrease in protein content of the feed, and an increase of 114 or a decrease of 17 Calories of productive energy per pound of feed. Data obtained indicate that suddenly changing the Calorie-protein ratio in the feed has no deleterious effect upon rate of egg production.—*R. H. Harms.* (Biological Abstracts)

JENSEN, LEO S., and **JAMES McGINNIS.** (State Coll. Washington, Pullman.)
EFFECT OF DIFFERENT DIETS AND UNIDENTIFIED FACTOR SUPPLEMENTS ON REPRODUCTION IN CHICKENS AND EARLY CHICK GROWTH. *Poultry Sci. 36(2):* 312-319. 1957.—An experiment was conducted with White Leghorn chickens to study the needs of the mature fowl for unidentified factors. Supplementation of a corn-soy basal diet with fish solubles, forage juice, distillers' dried solubles, or combinations of these unidentified factor sources, and supplementation of a fishmeal-sucrose semi-purified type basal diet with forage juice or distillers' dried solubles, or a combination of these two materials, failed to affect egg production, egg weight, or hatchability of fertile eggs. Higher egg production and larger eggs were obtained on the corn-soy basal treatments than on the purified basal diet treatments. No difference in hatchability was observed between these two rations. Carryover studies with chicks failed to demonstrate any depletion effect for the unidentified factors studied in this experiment. A difference in growth rate was observed between chicks from the hens fed practical diets and chicks from the hens fed purified diets, regardless of the treatment given the chicks.—Author. (Biological Abstracts)

JOHNSON, CONWELL W., STANLEY L. BALLOUN, and VIRGIL W. HAYS. (Iowa State Coll., Ames.)
DEHYDRATED SILAGE FOR POULTRY. I. THE EFFECT OF DEHYDRATED CORN SILAGE MEAL ON GROWTH AND FEED CONVERSION OF THE CHICK. *Poultry Sci. 36(2):* 341-344. 1957.—When corn silage, dried at 60-70°C, was used at levels varying up to 5% of the diet in place of alfalfa meal in chick diets, feed conversion, but not growth, was linearly improved.—*S. L. Balloun.* (Biological Abstracts)

JUKES, H. G., D. C. HILL, and H. D. BRANION. (Ontario Agric. Coll., Guelph, Canada.)
EFFECT OF PENICILLIN ON THE CARCASS COMPOSITION OF THE CHICKEN. *Poultry Sci. 36(2):* 423-425. 1957.—Two experiments were conducted to study the effect of the addition of penicillin to the diet on the moisture, protein, fat and ash content of chickens. A higher percentage body fat was recorded in both experiments but only in one experiment was the difference statistically significant. A small reduction in percentage moisture, protein and ash was also noted when penicillin was fed, but the differences were not statistically significant. The greater average weight of birds receiving penicillin was not accounted for solely by an increase in fat.—*D. C. Hill.* (Biological Abstracts)

KLAIN, G. J., D. C. HILL, J. A. GRAY, and H. D. BRANION.
ACHROMATOSIS IN THE FEATHERS OF CHICKS FED LYSINE-DEFICIENT DIETS. *J. Nutrition,* 1957, *61,* 317-328. [Dept. Nutrit., Ontario Agric. Coll., Guelph.]—Four breeds of chicks, Barred Plymouth Rocks, Black Australorps, Black Minorcas and a New Hampshire×Barred Plymouth Rock cross, were given for 4 weeks a diet of low lysine content, 0.65 per cent, alone or supplemented with lysine. On the basal diet alone, there was depigmentation of the feathers, particularly in male birds, which was most evident at 4 weeks of age. The achromatosis was prevented almost entirely by supplementary lysine, but was not improved by Cu, folic acid or iodinated casein. The addition of 0.5 per cent L-tyrosine slightly reduced the severtity of the condition. There were only minor differences in amino acid composition between normal and abnormal feathers, and no difference in the Cu content. The tyrosinase activity of feather quill homogenates, as measured by pigment production on incubation with tyrosine, was less in achromatous than in normal feathers. There was some evidence that Black Australorp chicks have a lower requirement of lysine for growth than the other 3 breeds. (Nutrition Abstracts and Reviews)

KRATZER, F. H. (U. California, Berkeley.)
RESEARCH IN TURKEY NUTRITION. *Feedstuffs 28(7): 85-96.* 1956.—Protein requirement of turkey poults is approximately 20% at 8 weeks, 15% at 16 weeks, and 13-14%at 20-24 weeks. Rapeseed meal contains a goitrogen, but the protein appears to be adequate. It does not contain excess lysine for supplementary purposes. Lysine should be added in practical diets where rapeseed oil meal is used. Bone meal added to a basal ration containing 2.1% Ca and 1.0% P (0.63 inorganic) did not produce slower growth until a 6% level was reached and there was no difference in leg disorders. Added whey produced a slight hatchability response. The folic acid requirement of turkey breeders is approximately 0.7 mg/kg of feed.—*H. L. Wilcke.* (Biological Abstracts)

KRATZER, F. H., and P. N. DAVIS. (U. California, Davis.)
THE EFFECT OF DEHYDRATED ALFALFA MEAL IN THE BREEDER RATION ON HATCHABILITY IN TURKEYS AND ON THE RESPONSE OF POULTS TO ALFALFA FEEDING. *Poultry Sci. 36(3):* 487-490. 1957.—Turkey breeder hens were fed rations containing various levels of dehydrated alfalfa meal. Rations containing up to 30% of alfalfa meal caused no reduction in egg production or hatchability. Poults from hens fed 30% alfalfa meal grew as well as poults from hens fed no alfalfa meal while 10 and 20% of alfalfa meal in the poult ration depressed growth, regardless of the diet of the hen. —*F. H. Kratzer.* (Biological Abstracts)

KRATZER, F. H., and **NORMAN GREEN.** (U. California, Davis.)
THE AVAILABILITY OF LYSINE IN BLOOD MEAL FOR CHICKS AND POULTS. *Poultry Sci. 36(3):* 562-565. 1957.—Blood meal samples were bioassayed for lysine by substituting them for sesame seed oil meal in chick and poult rations deficient in lysine. Spray dried soluble blood meal was found to contain approximately 10-12% lysine by chick and poult assay. This was approximately 75% as much as found by microbiological assay after acid hydrolysis. Vat-dried blood meal contained approximately 6-8% lysine by chick and poult assay which was about 60% of that found microbiologically.—*F. H. Kratzer.* (Biological Abstracts)

KURNICK, A. A. (Texas Agric. and Mechanical Coll., College Station), **B. L. REID, R. N. BURROUGHS, H. D. STELZNER,** and **J. R. COUCH.**
EFFECT OF DISTILLERS DRIED SOLUBLES AND MOLYBDENUM ON THE GROWING CHICK. *Proc. Soc. Exptl. Biol. and Med. 95(2):* 353-356. 1957.—A study was conducted with New Hampshire chicks from dams fed an all-vegetable protein diet containing no added unidentified growth factors. The basal diet consisted of water extracted soybean protein and glucose monohydrate supplemented to meet the requirements of the chick. Growth of chicks was significantly improved by the addition of distillers dried solubles, sodium molybdate or a mixture of unidentified factor sources. Removal of the molybdenum from the ash of distillers dried solubles resulted in the same growth rate exhibited by the control group. The ash of this product produced a 9.1% increase in growth; which was not quite significant. Bone ash values were not affected by the dietary treatments. Intestinal xanthine dehydrogenase activities were significantly increased in all cases except the "molybdenum-free" distillers dried solubles ash-fed group.—Authors. (Biological Abstracts)

LINK, R. P. (U. Illinois Agric. Expt. Sta., Urbana), **JEAN C. SMITH** (Kansas State Soll., Manhattan), and **C. C. MORRILL.** (Michigan State U., E. Lansing.)
TOXICITY STUDIES ON CAPTAN-TREATED CORN IN PIGS AND CHICKENS. *Jour. Amer. Vet. Med. Assoc. 128(12):* 614-616. 1956.—The fungicide, captan (N-trichloromethylthiotetrahydrophthalimide), did not affect the palatability or nutrient quality of a balanced ration containing 82% corn treated with 0.93 oz. captan/100 lb. when fed to pigs for 96 days. No pathological changes were detected in the tissues of the hogs, and captan was not found in the tissues. Chicks fed a ration of 55% corn similarly treated with captan gained weight at a slightly faster rate than those receiving the ration with untreated corn.—*J. F. Ryff.* (Biological Abstracts)

McCAUGHLEY, W. F., W. F. FLEMING, M. G. VAVICH, and **A. R. KEMMERER.** (U. Arizona, Tuscon.)
EFFECT OF HEAT TREATMENT OF ALFALFA ON AVAILABILITY OF CAROTENE TO CHICKS. *Poultry Sci. 36(2):* 323-328. 1957.—Availability to chicks of carotene was compared in alfalfa samples treated in 1 of 3 ways: heat-treatment followed by sun-curing, sun-curing alone, or steam-blanching. Although heat-treating caused considerably higher retention of the provitamin A than sun-curing alone, this carotene was somewhat less available, as measured by chick growth, than that provided by sun-cured or steam-blanched alfalfa. When alfalfa representing 7 times as much carotene was provided in the diets, the heat-treated alfalfa produced up to 50% less storage of vitamin A in the livers of the chicks than did the sun-cured or steam-blanched alfalfa. This effect could not be accounted for by any alteration in carotene stereoisomer composition. Chicks fed a complete diet containing 3% of heat-blanched alfalfa showed increased gains in 4 weeks over those fed 3% of sun-cured alfalfa, indicating a stabilizing effect on the unidentified growth factor activity brought about by the heat treatment. (Biological Abstracts)

McDONALD, M. W. (Poultry Expt. Sta., Seven Hills, N.S. Wales.)
METHIONINE SUPPLEMENTS IN CHICKEN DIETS. I. EFFECT OF SUPPLEMENTARY METHIONINE AND CHOLINE ON GROWTH AND FOLIC ACID REQUIREMENTS OF WHITE LEGHORN CHICKENS. *Australian Jour. Agric. Res. 8(3):* 218-324. Illus. 1957.—The addition of 0.2 per cent DL-methionine to a diet based on wheatmeal, meatmeal, and whey powder produced a 12 per cent increase in weight at 6 weeks in White Leghorn chickens. Although the addition of 4.4 ppm of folic acid to the basal diet produced no response, the addition of folic acid to the methionine-supplemented diet produced a further 7 per cent increase in weight. In a second experiment, supplementing the same basal diet with 0.066 per cent choline chloride produced a 17 per cent growth depression which was prevented by the addition of folic acid. Methionine (0.2 per cent), added to the basal diet supplemented with 0.066 per cent choline chloride and 4.4 ppm folic acid, produced a 5 per cent growth increase, proving that the basal diet was deficient in sulphur-amino acids. It is suggested that folic acid is required for the catabolism of methyl groups provided in excess of the chicken's requirements.—Auth. summ. (Biological Abstracts)

MacINTYRE, T. M. (Canada Dept. Agric., Nappan, Nova Scotia.)
VARIABILITY IN THE NUTRITIVE VALUE OF FISH MEALS FOR GROWING CHICKENS. *Canadian Jour. Animal Sci. 37(1):* 58-63. Illus. 1957.—Studies were made of the variation in quality of commercial fish meals produced in the Atlantic Provinces of Canada. A chick growth method was used for estimating the protein quality of the fish meals. Forty different samples of fish meal were tested. Results indicate that there is considerable variation in the growth-promoting qualities of commercial fish meals. This variation in growth appears to be due to variation in the protein quality of the fish meals.—Auth. abst. (Biological Abstracts)

MAHADEVAN, P., D. G. PANDITTESEKERA, J. S. L. WHITE, and **V. ARUMUGAM.** (Dept. Agric., Peradeniya, Ceylon.)
THE EFFECTS OF TROPICAL FEEDING STUFFS ON GROWTH AND FIRST YEAR EGG PRODUCTION. *Poultry Sci. 36(2):* 286-295. 1957.—Analyses of growth rate of S.C. White Leghorn chicks were carried out using the exponential growth cure $y=ae^{bx}$ with a view to determining the maximum quantity of coconut meal that could be incorporated in chick rations and the minimum quantities of cereal and fish meal required to balance such rations. High energy diets containing not more than 20% coconut meal proved most satisfactory not only for growth but also for egg production and efficiency of feed utilization. But, where the productive energy content of the diets were so high as to limit the consumption of feed below the level necessary to provide the nutritive essentials of chicks, it was found that growth was retarded. The best balance of nutrients for economic egg production under tropical conditions was provided by a ration containing 20% coconut meal, 45% cereal, 9% fish meal, 21% rice bran, 2% gingelly cake and 3% cowpea supplemented with vitamins and minerals. In the chick and grower stages however, the birds appear to be able to tolerate somewhat larger quantities of coconut meal in their diets without any appreciable deterimental effects on growth.—*P. Mahadevan.* (Biological Abstracts)

MANTEL, K. Ein Beitrag zur Frage: Futter in Mehlform oder gekörnt?
CONTRIBUTIONS TO THE QUESTION: FEED AS MEAL OR PELLETS? *Deutsch. Wirtschaftsgeflügelzucht,* 1957, *9,* 302-304. [Erding.]—For 351 days, 4 groups of 60 hens were given either grain and a laying meal in meal form or as pellets, or an all-mash ration as meal or as pellets. Results were: daily feed consumption per hen 124.2, 138.6, 111.0 and 123.7 g., egg production 205.8, 208.3, 197 and 207.3, weight increase 5, 135, — 100 and 65 g., and feed required per 100 g. eggs produced 230.6, 244.3, 238 and 245.4 g. With either feed, production was better on pellets, but the cost of production was slightly less on meal. (Nutrition Abstracts and Reviews)

MARCH, B., and JACOB BIELY. (U. British Columbia, Vancouver, Canada.)
FOLIC ACID SUPPLEMENTATION OF HIGH PROTEIN—HIGH FAT DIETS. *Poultry Sci. 35(3):* 550-551. 1956.—Chicks were fed diets of natural ingredients containing 20 and 26% protein and formulated with and without 7.5% tallow. Each diet was fed at levels of 0.15, 0.40 and 0.65 mg of folic acid per lb. The rates of growth of chicks fed the diets in 2 experiments are presented. It is concluded that the folic acid requirement of chicks is increased with high protein—high fat diets.—*J. Biely.* (Biological Abstracts)

MARSDEN, STANLEY J., LUCY M. ALEXANDER, JESSIE C. LAMB, and GRACE S. LINTON. (U.S. Dept. Agric., Beltsville, Md.)
RELATIONSHIPS AMONG DIET COMPOSITION, FLESHING, FATNESS, AND EDIBLE QUALITY OF FEMALE ROASTING TURKEYS. PART I. FISH PRODUCTS IN STARTERS AND GROWERS. *Poultry Sci. 36(3)* 635-646. 1957.—Small-type crossbred turkeys, 26-34 weeks old were graded, roasted, and tasted. 24 "controls" were fed fish products in starting diets, followed by non-fishy growing diets; 64 were fed fish products in starting diets, followed by growing diets with fish meals. The fatter the latter turkeys were, the more the roasted meat was down-graded for off-flavors, predominantly fishy. This was true whether the increased fatness was associated with greater age, or addition of 15% white fish meal and 0.375% refined cod-liver oil concentrate to the all-mash starters fed 0-8 weeks, or the inclusion in the all-mash growers of 7.5 to 9.2% white fish meal or 8% West Coast sardine meal. The sardine meal caused appreciable amounts of fishy flavor; the white fish meal caused very large amounts. Corn, wheat, or oats, respectively, in larger than normal proportions in growers containing fish meal did not prevent or reduce fishy flavor; however, 2% refined cottonseed oil with oats in a grower containing 9.2% white fish meal appeared to reduce undesirable flavors.—Authors. (Biological Abstracts)

MARSDEN, STANLEY J., LUCY M. ALEXANDER, JESSIE C. LAMB, and GRACE S. LINTON. (U. S. Dept. Agric., Beltsville, Md.)
RELATIONSHIPS AMONG DIET COMPOSITION, FLESHING, FATNESS, AND EDIBLE QUALITY OF FEMALE ROASTING TURKEYS. PART 2. FISH PRODUCTS IN STARTERS; CEREAL GRAINS AND OILCAKE MEALS IN GROWERS. *Poultry Sci. 36(3):* 646-657. 1957.— After 8 weeks on fishy starters (Part 1), small-type crossbred turkeys were fed to 26-34 weeks on all-mash growers containing respectively, 50% corn, 53% oats, 55% wheat, 54% barley,18% corn gluten meal, 18% soybean meal, 17% peanut meal, 19% cottonseed meal, and 10% linseed oil meal. Turkeys (64) fed the 4 edible meals were, on the average, graded fatter than 64 fed the 4 cereal-grain diets, and those on cereal grains were fatter than 40 fed linseed-oil-meal diets. In flavor, turkeys on cereal grains were about equal to "controls" (Part 1); those fed edible oil meals rated very slightly inferior; those fed linseed meal were definitely inferior and were not improved by the inclusion of alfalfa, oats, or oats with 2% refined cottonseed oil. Juiciness of 256 turkeys (88 from Part 1) was generally associated with fatness, and tenderness with juiciness, but with increased plumpness of breast the breast meat showed a tendency to decrease in tenderness. Juiciness and tenderness were not materially influenced by variations in the growing diets.—Authors. (Biological Abstracts)

MOFFATT, B. W.
THE CASE OF POULTRY SUPPLEMENTS. *Queensland Agric. Jour. 82(5):* 296-299. Illus. 1956.—Vitamin A deficiency is common among fowls in Queensland because good quality greenfeed cannot be supplied the year around. Birds without vitamin A do not make proper growth, lack resistance to certain diseases and produce eggs poorly. The value of feeding a fish-oil supplement was demonstrated on 4

poultry farms where some fowls were given greenfeed only and others greenfeed plus fish oil. On one farm the fish-oil fed hens laid an average of 90 eggs in 6 months, the other hens 16.6 eggs fewer. The average for the 4 farms was about 93-88. Lawn clippings cut every day are recommended for poultry, using 5 lb. for each 100 birds. The lawn is more valuable when it contains a mixture of clover and grass.—*T. L. Bissell.* (Biological Abstracts)

MORGAN, JOSEPH F., and **HELEN J. MORTON.** (Lab. Hyg., Ottawa, Canada.)

NUTRITION OF ANIMAL TISSUES CULTIVATED IN VITRO IV. AMINO ACID REQUIREMENTS OF CHICK EMBRYONIC HEART FIBROBLASTS. *Jour. Biophys. and Biochem. Cytol. 3(2):* 141-150. Illus. 1957.—The amino acid requirements of freshly explanted chick embryonic heart tissues cultivated in completely syntheitc media were determined, employing a nutritional depletion technique. Arginine, histidine, lysine, tyrosine, tryptophan, phenylalanine, cystine, methionine, threonine, leucine and valine were essential. Serine, isoleucine, glycine and glutamine were non-essential. Glutamic acid, aspartic acid, alpha-alanine, proline, and hydroxyproline were inhibitory. A comparison was made of the amino acid requirements of various types of tissue cultures, of the chick, and of man and certain differences in these requirements were discussed.—*J. F. Morgan.* (Biological Abstracts)

MULLER, Z., and Z. PEKAREK. 1957. Prispevek ke studiu vlivu jodovaneho kaseinu na snasku slepic.

THE EFFECT OF IODISED CASEIN ON EGG PRODUCTION. *Sborn. csl. Akad. Zemed. Ved. Zivoc. Vyr., 2(30):* 229-242. [Russian, English and German summaries.]—Iodised casein was administered orally to ten 3-yr.-old hens. At the end of 7 mths. production averaged 84.3 eggs *v.* 79.4 for the 5 untreated controls. The body weight of the treated hens averaged 10% less and egg weight averaged 9% less than those of the controls.

In a further experiment iodised casein was administered to 10 Rhode Island Red pullets. Some came into lay at the beginning of Jan. while the 3 controls did not come into lay until mid-Feb. To the end of March the 10 treated pullets produced a total of 313 eggs *v.* 50 for the 3 controls. Average egg weight was less in the experimental group, but body weight did not decline. (Animal Breeding Abstracts)

NABER, EDWARD C. (Ohio State U., Columbus), and, **CHARLES L. MORGAN.**

STUDIES ON A HATCHABILITY DEPRESSING FACTOR IN COTTONSEED OIL. *Poultry Sci. 36(2):* 429-431. 1957.—Hydraulic process crude cottonseed oil depressed hatchability of chicken eggs when added to the maternal diet at the 5% level. Crude cottonseed soapstock did not depress hatchability. While commercially refined cottonseed oil failed to depress hatchability, this same oil heated at 95°C for 300 hours produced a marked depression in hatchability. Data indicate that the hatchability depressing factor present in the crude cottonseed oil is removed by the commercial refining process and can be regenerated in the refined oil by heating and aeration.—Auth. summ. (Biological Abstracts)

NIKKILA, E. A. and **O. OLLILA.**

EFFECT OF LOW PROTEIN DIET ON THE SERUM LIPIDS AND ATHEROSCLEROSIS OF CHOLESTEROL-FED CHICKENS. *Acta pathol. microbiol. scand.,* 1957. *40,* 177-180. [1. Dept. Med., Univ. Helsinki.]—In the course of 25 weeks chicks fed on normal diet with added cholesterol or on low-protein diet did not differ significantly from birds fed on normal diet in terms of serum cholesterol, serum phospholipin or degree of atheroma. Chicks given low-protein diet with cholesterol developed high blood cholesterol, aortic atheromatosis and fatty degeneration of the liver.

It is suggested that the condition of birds on the low-protein diet might be due to impariment of excretion of cholesterol by damaged liver cells. (Nutrition Abstracts and Reviews)

O'DELL, R. L., and J. E. SAVAGE. (U. Missouri, Columbia.)
POTASSIUM, ZINC AND DISTILLERS DRIED SOLUBLES AS SUPPLEMENTS TO A PURIFIED DIET. *Poultry Sci. 36(2):* 459-460. 1957.—White Rock male chicks were fed a purified diet that contained 25% of an isolated soybean protein (Drackett) and the mineral mixture of Dannenburg et al. (Poultry Sci. 34, 1023). The diet contained inadequate K for maximum growth. Distillers dried solubles improved the rate of growth and a supplement of K and Zn salts supported an equal rate of gain. It is suggested that under these dietary conditions the chick has a higher requirement for Zn than is commonly supplied by synthetic mineral mixtures and that Zn may be the unrecognized mineral nutrient in distillers solubles.—Auth. summ. (Biological Abstracts)

PERDUE, HENRY S., HENRY C. SPRUTH, and DOUGLAS V. FROST. (Abbott Labs., North Chicago, Ill.)
COMPARISON OF VITAMIN K ACTIVITIES OF VITAMIN K_1 AND KLOTOGEN (MENADIONE SODIUM BISULFITE COMPLEX. *Poultry Sci. 36(3):* 633-635. 1957.—Comparison is made of Klotogen F (Abbott) and vitamin K_1 as sources of vitamin K for the chicken when both are mixed in the feed. Graded levels of the two substances were added to a vitamin K-low modification of the Animal Nutrition Research Council reference broiler ration (J. Nutrition 59: 181-196, 1956). Ten groups of day-old New Hampshire cockerels were housed in brooders with raised wire floors. All groups were fed the vitamin K-low diet for one week. One group was then assigned to each of the experimental diets. Whole blood prothrombin clotting times were determined after 2 weeks on the experimental diets. Plotting the reciprocal of the prothrombin time against the logarithm of the dietary additions of vitamin K_1 or Klotogen F revealed a log-dose relationship. From this, the potency of Klotogen F in maintaining the chick's prothrombin was 1.5 times that of vitamin K_1. On the basis of menadione content as calculated from molecular composition, the activity of Klotogen F was 1.7 times that of vitamin K_1. The vitamin K_1 allowance of 0.18 mg/lb of feed recommended by the National Research Council (1954) was not fully adequate in this test.—Auth. summ. (Biological Abstracts)

PEROLD, I. S. (Stellenbosch-Elsenberg Coll. Agric., Stellenbosch, South Africa.)
MICRO ELEMENTS IN POULTRY NUTRITION. *World's Poultry Sci. Jour. 12(3):* 210-221. 1956.—Mn, cobalt, I, Cu, Fz, and Se are discussed.—*J. B. Christiansen.* (Biological Abstracts)

RAPPINI, F. and P. SEMPRINI. Azione della terramicina e del *Vigofac* associati sull'accrescimento di *Gallus gallus* in regime dietetico esclusivamente vegetale.
EFFECT OF TERRAMYCIN AND VIGOFAC TOGETHER ON THE GROWTH OF *GALLUS GALLUS* ON AN EXCLUSIVELY VEGETABLE DIET. *Boll. Soc. ital. Biol. sper.*, 1956, *32*, 1467-1468; 1468-1469; 1470-1471. [Ist. Zootec. Gen., Univ. Bologna.]—(a) Terramycin was given as the product TM 5, which contained 11 g. active antibiotic per kg.

Two groups of 40 chicks initially 3 days old were fed in battery for 11 weeks on a ration of a mixture of maizemeal, ricemeal, wheat pollards, soya meal, groundnut cake, dried lucerne, minerals and vitamins. One group received 1.5 g. TM 5 per kg. ration. The ration contained 20-38 per cent crude protein.

At the end of 5 weeks the treated chicks weighed on the average 36 g. more than controls, but at 6 weeks the difference was only 5 g. and at the end of the experiment the position was reversed and the treated birds were on the average 55 g. lighter, though the difference was perhaps not significant because the wide range of weights in the experimental group, from 640 to 1120 g.

(b) In a similar experiment 40 chicks received per kg. ration 1.5 g. Vigofac, a commercial preparation containing fish products.

The treated chicks had an advantage in weight after the first week and maintained it to the end, so that after 11 weeks they were 120 g. heavier than the controls.

(c) In a similar experiment the treated chicks received per kg. ration 0.75 g. each of TM 5 and Vigofac.

From the first week they maintained an advantage in weight over the controls, and at 11 weeks they were on the average 80 g. heavier. (Nutrition Abstracts and Reviews)

REDMAN, C. E., and **J. ROBERT SMYTH, Jr.** (U. Massachusetts, Amherst.)

THE EFFECT OF FURAZOLIDONE ON THE REPRODUCTIVE ABILITY OF THE MALE TURKEY. *Poultry Sci. 36(2):* 437-443. 1957.—To study the possible effects of feeding furazolidone at a 0.011% level on reproduction in the male turkey, four groups of 58 males each were fed the drug for different periods of time. Sexual maturity, as determined by the first measurable semen yield, was delayed in the group receiving furazolidone continuously from hatching time. Four of 30 males in this group had failed to produce semen when sacrificed at 296 days of age. The remaining males in this group had an average maturity age of 208.3 days, which was approximately one week later than were the means for the other groups. After attaining sexual maturity none of the treatment groups differed significantly in respect to semen volume, initial motility, fertility or hatchabiliy of fertile eggs when mated with untreated females. Furazolidone had no effect on rate of growth to 175 days of age.—*J. R. Smyth, Jr.* (Biological Abstracts)

REID, B. L. (Texas A. and M., College Station), **A. A. KURNICK, R. N. BURROUGHS, R. L. SVACHA,** and **J. R. COUCH.**

MOLYBDENUM IN POULT NUTRITION. *Proc. Soc. Exptl. Biol. and Med. 94(4):* 737-740. 1957.—Weights of turkey poults fed a purified type diet were increased significantly upon addition of distillers dried solubles, distillers dried solubles ash, molybdenum (0.0254 ppm) or a mixture of distillers dried solubles, dried whey, fish solubles, an antibiotic fermentation residue, and forage juice. Although differences of as much as 2% in bone ash were observed, statistical significance was not obtained. Both liver and intestinal xanthine dehydrogenase activities were significantly higher in supplemented groups as compared to control birds. A significant ($P<0.05$) correlation was determined between liver molybdenum content and level of enzyme activity. Under the conditions of this study a portion of growth promoting activity of distillers dried solubles ash would appear to be explained on the basis of molybdenum content.—Authors. (Biological Abstracts)

REYNTENS, N. and **F. OKERMAN.** L'emploi de farine de plumes dans l'alimentation des poussins.

FEATHER MEAL FOR FEEDING CHICKENS. *Rev. Agric., Brussels,* 1957, *10,* 360-368. [Stat. Petit Elevage de l'Etat, Gontrode.] English and German summaries.—Groups of day-old cockerels were given rations with 10 per cent fishmeal, or feather meal replacing one-half, one-quarter or all the fishmeal. Growth and efficiency at 3 and 6 weeks of age were progressively reduced by increasing proportions of feather meal: in the group getting all feather meal, growth was only 29 per cent of that of the fishmeal group, and feed per kg. gain was 189 per cent. The ration giving the worst results had 18 per cent digestible crude protein compared with 15 per cent in the best. There were severe outbreaks of cannibalism in the feather meal group.

In a second trial the control ration of day-old chicks had 10 per cent fishmeal and experimental groups got fishmeal 7 and feather meal 3 per cent with or without 50 g. methionine per 100 g. feed. The basal ration in the second trial, but not in the first, included skimmed milk as another source of animal protein. Growth and efficiency to 6 weeks were again in favour of the control group, but the difference in this trial was not significant. (Nutrition Abstracts and Reviews)

ROBERTS, ROY E. (Purdue U., Lafayette, Indiana.)
SALT TOLERANCE OF TURKEYS. *Poultry Sci. 36(3):* 672-673. 1957.—For periods of 4 weeks, the consumption of rations containing iodized salt at levels as high as 4% by 8-week old Bronze males and as high as 8% by 26-week old Bronze females caused no mortality. The only noticeable difference was a marked increase in water consumption on the high levels of salt.—*Roy E. Roberts.* (Biological Abstracts)

ROSENBERG, HANS R., and J. T. BALDINI. (Stine Lab., E. I. du Pont de Nemours and Co., Newark, Del.)
EFFECT OF DIETARY PROTEIN LEVEL ON THE METHIONINE-ENERGY RELATIONSHIP IN BROILER DIETS. *Poultry Sci. 36(2):* 247-252. 1957.—In seven 8- and 10-week experiments the methionine requirement of the growing chick was investigated with diets containing 20, 24, 26 and 28% protein at productive energy levels of 900 and 1050 cal/lb. The results obtained with isocaloric diets at different protein levels indicate that the energy content of the diet governs the methionine requirement. When sufficient energy is available from non-protein sources to permit full utilization of the protein for tissue synthesis and repair methionine requirement, expressed as percent of diet, increases as protein level increases. In the absence of a sufficient amount of energy to permit the bird to make full use of the protein offered for growth purposes, increasing levels of dietary protein were found not to require corresponding amounts of methionine. Using isonitrogenous diets, the methionine requirement, expressed as percent of diet, increases as the energy content of the diet is increased.—*H. R. Rosenberg.* (Biological Abstracts)

ROSENBERG, M. M., and T. TANAKA. (Hawaii Agric. Exp. Sta., Honolu'u.)
EFFECT OF LENGTH OF STORAGE OF MIXED FEED ON THE GROWTH RATE OF CHICKS. *Feedstuffs 28(31):* 29-30, 32. 1956.—Results of studies with broilers indicate that feed loses its palatability beginning with the 4th or 5th week of storage. Females do not seem to be affected as early as males. There was a higher mortality in the first six weeks in chicks fed stored feed but this may or may not have been significant.—*H. L. Wilcke.* (Biological Abstracts)

ROUX, A. C. (Lemoenkloof Poultry Farm, Kliphewel, Cape Province, South Africa.)
RESULTS OF FEEDING LOW GRADE COD LIVER OIL ON A COMMERCIAL FARM. *World's Poultry Sci. Jour. 13(2):* 122-124. 1957.—Six thousand 4- to 8-week old chickens developed typical rickets in commercial batteries. The diet contained 0.5% cod liver oil. Higher doses of cod liver oil had no effect, but the condition responded to synthetic vitamin D_3. The oil had been stored in 45 gallon drums in direct sunlight.—*J. B. Christiansen.* (Biological Abstracts)

RUHDEL, H. J. Uber den Futterwert pflanzlicher Eiweissfuttermittel in der Gelfügelfütterung.
NUTRITIVE VALUE OF PLANT PROTEIN FEEDS FOR POULTRY. *Deutsch. Wirtschaftsgeflügelzucht,* 1957, *9,* 194-195; 213-214; 264-266. [Ulm, Donau.]—The composition of different protein feeds suitable for poultry is tabulated and results of digestibility trials are given. Oilcakes can be widely used to save animal protein; laying hens can take up to 20 per cent of extracted soya meal, groundnut meal, sesame meal, sunflower meal or coconut meal or of legumes such as beans or sweet lupins. (Nutrition Abstracts and Reviews)

SANSON, W. R., and L. D. MATTERSON. (U. Connecticut, Storrs.)
THE USE OF DIMETHYL-BETA-PROPIOTHETIN AS A SUBSTITUTE FOR SUPPLEMENTAL METHIONINE IN A PURIFIED DIET DEFICIENT IN SULPHUR AMINO ACID. *Poultry Sci. 36(2):* 411-413. 1957.—Sixteen groups of seven 2-week-old cockerels, of nearly equal weights, were placed in battery pens arranged in a 4 x 4 Latin

Square design. Dimethyl-beta-propiothetin hydrochloride and DL-methionine were added equimolecularly to a basal diet adequate in indispensable methionine (0.45%) but deficient in total sulfur amino acid. Methionine significantly improved the diet for growth; dimethyl-beta-propiothetin did not. The effectiveness of added methionine in improving growth and feed efficiency was significantly impaired by the presence of equimolecular amounts of dimethyl-beta-propiothetin.—*L. D. Matterson.* (Biological Abstracts)

SCOTT, M. L., and G. F. HEUSER. (Cornell U., Ithaca, N. Y.)
THE VALUE OF GRIT FOR CHICKENS AND TURKEYS. *Poultry Sci. 36(2):* 276-283. 1957.—Experiments were conducted with chicks, turkeys and laying hens on the effect of calcium grits and insoluble grits, singly and in combination, upon growth, egg production and efficiency of feed utilization, under mash-and-grain systems of feeding. Results indicated that: (1) Insoluble grit, either granite or feldspar, improved growth, egg production and efficiency of feed utilization when fed to chickens or turkeys receiving mash and grains, as compared with similar lots of birds receiving the same ration without grit or with only a calcium grit. (2) Crushed limestone grit (calcite) and crushed oyster shell appeared not to be suited to the dual purpose of supplying calcium and aiding the gizzard in its grinding process, as evidenced by the failure of these materials to improve growth, egg production or feed utilization in chickens or turkeys receiving mash and grain, and by the fact that whole grains (wheat) were found in the gizzards of hens fed oyster shell as the only grit. (3) Growing chicks may overeat calcium grits somewhat when the diet is already adequate in calcium and when no insoluble grit is fed. Growing turkeys and laying hens, on the other hand, when fed mash-and-grain rations, which require supplementation with extra calcium, appear to be able to adjust calcium intake to their needs whether or not they also have access to insoluble grit. (4) In growing turkeys receiving mash and grain, supplemental calcium may be needed for maximum bone calification and the prevention of leg weakness. It is possible, however, that for prevention of leg weakness, an unknown mineral, present in the calcite used in these studies, is required. (5) Granite grit and feldspar grit were consumed equally well when fed singly, but the chicks, turkeys and laying hens all preferred feldspar grit to granite grit when given the opportunity to choose between them.—Auth. summ. (Biological Abstracts)

SULLIVAN, T. W., and E. L. STEPHENSON. (U. Arkansas, Fayetteville.)
EFFECT OF PROCESSING METHODS ON THE UTILIZATION OF HYDROLYZED POULTRY FEATHERS BY GROWING CHICKS. *Poultry Sci. 36(2):* 361-365. 1957.—Hydrolyzed poultry feather samples were prepared through use of steam pressure cooking. Various levels of pressure and times of cooking were employed. The resulting products were fed to chicks at levels of 2.5, 5.0, and 7.5% of the diet. There was no statistical difference noted in growth rate of chicks fed the different samples at comparable levels. The only statistically significant finding was between levels of materials fed. Five percent of hydrolyzed poultry feathers was the highest level tolerated without a growth depression. The feeding of 7.5% resulted in a significant depression.—Auth. summ. (Biological Abstracts)

THAYER, R. H. and D. L. BROOKS.
FEEDING HIGH-ENERGY RATIONS TO LAYING HENS. *Oklahoma Agric. Exp. Stat. Bull.* No. B-480, December 1956, pp. 19.—It is important to increase the amounts of protein, minerals and vitamins, and to have a correct amino acid composition of the protein, in order to maintain a balanced ration when energy is increased.

Four formulae are given, 2 with 23 per cent protein for use with scratch grain, and 2 with 17 per cent protein for use in all-mash feeding. The metabolisable energy of the rations is 1300 Cal. per lb. On each protein level one ration is more expensive and the other more suitable for commercial use. Optional additions of vitamins and methionine are

specified. Possible changes in proportions of cereals and in source of protein are indicated. In conditions of stress high levels of antibiotics, increased protein and vitamins are necessary. Suggestions for scratch grains are given.

In mash and grain systems oyster shell and grit should be provided. Drinking water must be supplied, more at temperatures above 90°F., and should be near the feed hoppers. The ratio of grain to mash should be 40 : 60.

A schedule of feeding from 2 weeks before housing for laying, month by month for 1 year, is presented and the results of trials with the rations (see following Abst.) are tabulated and discussed. (Nutrition Abstracts and Reviews)

THAYER, R. W., D. L. BROOKS, W. C. LOCKHART, R. M. YATES, V. G. HELLER, and W. R. KIRKHAM [KIRKMAN].

THE DEVELOPMENT AND TESTING OF HIGH ENERGY LAYER RATIONS FOR USE IN OKLAHOMA. *Oklahoma Agric. Exp. Stat. Tech. Bull.* No. T-66, December 1956, pp. 52.—In comparison with performance of a standard laying ration, egg production and efficiency improved when rations high in energy with or without riboflavin and nicotinic, pantothenic and folic acids in 2 or 3 times the amounts recommended by the National Research Council were given. The increased production was maintained longest with the highest level of vitamins. Without extra vitamins efficiency fluctuated greatly from month to month. The further advantage of adding vitamin B_{12}, pyridoxine, vitamins E and K, inositol and *p*-aminobenzoic acid was slight. A further increase of energy with improved quality of protein, extra minerals and sources of unidentified growth substances also slightly increased egg production and efficiency. In metabolism trials it was shown that the utilisation of energy was less on a ration low in energy, and the vitamin supplements had no effect. Utilisation of N was best on the ration highest in energy with the additions described. Utilisation of Ca and P was the same with all the rations. Results of laying trials from 1939 to 1954 are summarised. There was a gradual increase through the years, on the average 1.06 eggs per year when low-energy rations were used. Since the introduction of high-energy rations in 1950 the average annual increase has been 14.6 eggs. Average annual production per hen in the last 3 years was 227 eggs. (Nutrition Abstracts and Reviews)

THORNTON, P. A., L. G. BLAYLOCK, and R. E. MORENG. (Colorado State U., Fort Collins.)

PROTEIN LEVEL AS A FACTOR IN EGG PRODUCTION. *Poultry Sci. 36(3):* 552-557. 1957.—Four levels of protein, 17, 15, 13, and 11%, were tested for egg production factors in a high energy ration, Single Comb White Leghorn pullets maintained in wire cages were used as the test animal. Observations included egg production, feed efficiency, egg size, percent of eggs less than 24 oz./dozen and maintenance of body weight. Results showed that the 17, 15, and 13% levels of protein were comparable in maintenance of all factors. The 11% group was comparable for all factors except egg weight and percent of small eggs in which case the values were markedly depressed. Supplementation with methionine, lysine, and a combination of these two compounds at each level of protein had no effect on egg production, body weight or feed efficiency. Certain changes occurred in egg weight from these treatments; however, the changes were not of practical importance. Data indicate that a 13% protein ration is sufficient for normal egg production in caged layers.—Auth. summ. (Biological Abstracts)

THORNTON, P. A., P. J. SCHAIBLE, J. A. DAVIDSON and D. A. LIBBY.

THE EFFECT OF METHIONINE IN TURKEY STARTING AND GROWING FEEDS. *Quart. Bull. Michigan Agric. Exp. Stat.*, 1955, *37*, 301-306.—Groups of 50-day-old Bronze Breasted turkey poults were fed for 24 weeks on 3 different commercial turkey starter rations alone or supplemented with 0.05 per cent methionine. The protein content was 28 per cent, gradually reduced to 16 per cent at 20 weeks. At 8 weeks

there was no significant difference in weight between males and females in the control or methionine-fed groups, but at 24 weeks the males in the supplemented groups were significantly heavier than controls on 2 of the 3 rations; the females showed no significant difference. Up to 8 weeks the methionine supplement did not affect efficiency of feed conversion but at 24 weeks feed efficiency was improved on each of the 3 rations. It is concluded that toms have a higher methionine requirement than females during the late growing period. (Nutrition Abstracts and Reviews)

TOUCHBURN, S. P., J. BIELY, and B. MARCH. (U. British Columbia, Vancouver.)
THE EFFECT OF DEHYDRATED GREEN FEED ON FERTILITY AND HATCHABILITY OF EGGS FROM THREE GENERATIONS OF NEW HAMPSHIRE CHICKENS. *Poultry Sci. 36(3):* 591-595. 1957.—Dehydrated cereal grass and dehydrated alfalfa meals were tested as sources of unidentified fertility and hatchability factors for chickens. Three generations of New Hampshire chickens were fed experimental diets composed of natural ingredients and kept in confinement on deep litter. The average fertility was 97.0% and was not affected by the diet. A high level of hatchability was also obtained on all diets. Supplementation of the diets with dehydrated green feeds, however, had a slight but significant beneficial effect on hatchability in 2 of the 3 years. There was no consistent difference between 2.5 or 5.0% of either dehydrated cereal grass or dehydrated alfalfa. The fact that only a slight improvement in hatchability was obtained by the addition of dehydrated green feed may have been due to the inherently high hatchability possessed by the strain of birds used. On the other hand, bacterial synthesis in the litter may have provided a source of unknown hatchability factors not present in the diet.—Auth. summ. (Biological Abstracts)

VOHRA, P., and F. H. KRATZER.
THE ESSENTIAL NATURE OF LYSINE IN THE PREVENTION OF FEATHER DEPIGMENTATION OF TURKEY POULTS. *Arch. Biochem. Biophys.*, 1957, *68*, 76-80. [Dept. Poultry Husb., Univ. California, Davis.]—Broad Breasted Bronze turkey poults 1 to 3 days old were used in 3 experiments. A basal diet deficient in lysine, which produced white feathers within 10 days, was used. The compounds added were DL-lysine HCl, L-proline, L-ornithine, DL-homocitrulline, sub-optimum DL-lysine with or without DL-piperolic acid, DL-α-amino- hexanoic acid, ε-aminocaproic acid and ε-acetyl-DL-lysine. The levels of DL-lysine were 4.5, 6.0 and 7.4 m. moles per 100 g. ration. Only the highest level of DL-lysine was completely satisfactory in the gain of weight produced and prevention of white feathers. ε-Acetyl-DL-lysine gave a growth rate 70 per cent as good as DL-lysine when given at the same level. It required 12.2 m. moles ε-acetyl-DL-lysine to reduce white feathers. (Nutrition Abstracts and Reviews)

WEISS, H. S., and H. FISHER.
PLASMA LIPID AND ORGAN CHANGES ASSOCIATED WITH THE FEEDING OF ANIMAL FAT TO LAYING CHICKENS. *J. Nutrition*, 1957, *61*, 267-280. [Dept. Poultry Sci., Rutgers Univ., New Brunswick, N. J.]—From 8 to 32 weeks of age 127 Leghorn pullets received a ration containing 10 per cent fat; the source of fat was "yellow grease", standard colours of the Fat Analysis Committee of the American Oil Chemists' Society (FAC colour) 37 to 39, with 15 to 20 per cent free fatty acids and maximum moisture and unsaponifiable material 2 per cent. The 135 control birds received a standard laying ration with 7.5 per cent meat scrap of 6 per cent fat content. In a second experiment 25 birds which for 9 months had been fed on the control diet, were given for 8 weeks a diet containing 5 percent "yellow grease."

The birds on the diet containing 10 per cent fat grew faster than the controls, but failed to maintain satisfactory egg production. They

had significantly high plasma cholesterol values and post-mortem examination showed large renal and perirenal fat deposits; the livers were friable and fatty. Disturbance was less severe in the birds fed for 8 weeks on the diet containing 5 per cent added fat. (Nutrition Abstracts and Reviews)

WILLIAMS, CHRISTINE (U. Buffalo, New York), and **SIMON RODBARD.** WEAKNESS IN YOUNG CHICKS ON A DIET SUPPLEMENTED WITH ALUMINUM HYDROXIDE GEL. *Poultry Sci. 36(3):* 602-606. 1957.—A syndrome of weakness leading to death within a week after onset was produced by feeding young chicks a diet containing high concentrations of a reactive aluminum hydroxide gel. Lower concentrations did not produce the weakness, nor did non-reactive aluminum hydroxide gel or aluminum phosphate gel in comparable amounts. The weakness syndrome was associated with a reduction in the plasma carotene, vitamin A and cholesterol values. The syndrome was reversible if a regular mash diet replaced the gel diet within two days after onset of weakness. Replacement with vitamin supplements did not reverse the weakness syndrome. The syndrome was unlike the weakness due to decamethonium and it did not respond to neostigmine.—Auth. summ. (Biological Abstracts)

PATHOLOGY

GROSS, WALTER BURNHAM. (U. Minnesota, Minneapolis.) CHRONIC RESPIRATORY DISEASE OF CHICKENS AND INFECTIOUS SINUSITIS OF TURKEYS: ESCHERICHIA COLI AS A COMPLICATING FACTOR. *Dissertation Absts. 16(12):* 2433. 1956. (Biological Abstracts)

HENDERSON, EARL W. (Michigan State U., East Lansing) MORTALITY AMONG SIBLING AND NON-SIBLING CHICKS AND MATHEMATICAL PROBABILITY OF INFECTION AT HATCHING TIME. *Poultry Sci. 36(2):* 426-428. 1957.—Repetition of the incidence or mortality in groups of chicks with consecutive wing band numbers and the high incidence of mortality from certain families suggested a probability study of the mortality of the 1955 brood of 2060 chicks. The association of mortality with groups of consecutive band numbers was computed to be highly improbable by chance alone ($p=.00097$). There were 92 cases of mortality in paired or multiple series among 296 dead chicks. The high incidence of mortality among chicks with adjacent wing band numbers suggested the probability of infection or infestation either in the incubator from adjacent pedigree baskets or during the wing banding process. Since "paired" mortality occurred among 100 unpedigreed chicks also, it appeared that some pathogen was transmitted during the banding process. The parent stock would qualify as a "pullorum clean" flock by commercial standards and no cases of this disease were found in the entire season's brood. Mortality from coccidiosis was 3% of the flock and 22% of the total mortality. The incidence of the Avian Leukosis complex was less than 1% of the flock and 5% of the total mortality. Sixty-one percent of the total mortality was not diagnosed. Inherent susceptibility of chicks to unknown local pathogens was definitely indicated.—Author. (Biological Abstracts)

JUNGHERR, ERWIN L., EDWIN P. SINGSEN, and **LLOYD D. MATTERSON.** (U. Connecticut, Storrs.) NUTRITIONAL ENCEPHALOMALACIA OF CHICKENS. *Effect of treatment on the pathology. Lab. Invest. 5(1):* 120-131. Illus. 1956.—All neuropathologic expressions of nutritional encephalomalacia are apparently initiated by circulatory disturbance, but the pathologic end results often differ. They have been classified as ischemic, vacuolar,

sclerotic, vasculo-proliferative, and gliotic forms, with the first two considered degenerative, and the others reparative, in character. Following the introduction of N, N'-diphenyl-p-phenylene diamine or other antioxidants as preventive treatment in 1953, analysis of the Connecticut diagnostic data for 1952-54 indicated a progressive decline in incidence of the disease, but a relative increase of reparative pathologic forms. Treatment of chicks affected with experimental encephalomalacia at onset of symptoms, resulted in apparent recovery of about one half. Pathologic examination of successfully treated chicks 8 days after cessation of symptoms, disclosed in about 2/3 of the chicks residual lesions, of which 23.8% were of the degenerative, 76.2% of the reparative, type. With wider use of preventive treatments, the relative incidence of variant neuropathologic expressions is expected to increase and their recognition to gain added importance.—*E. L. Jungherr.* (Biological Abstracts)

POULTRY PRODUCTS AND MARKETING

BOSE, S., and **T. D. MAHADEVAN.** (I. V. R. I., Izatnager, India.)
STUDIES ON THE PRESERVATION OF DUCK EGGS. *World's Poultry Sci. Jour. 13(2):* 125-131. 1957.—Of the market eggs 15% are produced by ducks. At times up to 75% of these are lost through spoilage and breakage. Heating in water at 126°F for 10 minutes killed the embryo without coagulating the whites, slowed the rate of deterioration of yolks and white and improved eye appeal and flavor of stored eggs. Lime-sealing slowed loss in weight and added to the improvement by heat treatment. Deterioration of white and yolk quality and loss in weight were slower in duck eggs than with chickens.—*J. B. Christiansen.* (Biological Abstracts)

FRY, JACK L., and **GEORGE W. NEWELL.** (Oklahoma Agric. and Mechanical, Coll., Stillwater.)
MANAGEMENT AND HOLDING CONDITIONS AS THEY AFFECT THE INTERIOR QUALITY OF EGGS. *Poultry Sci. 36(2):* 240-246. 1957.—The effect of frequency of collection, method of cooling, and frequency of marketing on deterioration of interior quality of eggs as measured by Haugh units was evaluated. Observations were made at 3 environmental temperatures, 40°F, 60°F, and 90°F. Of the 3 factors only frequency of marketing was significant statistically and it proved so at all 3 temperatures. Daily observations on eggs held at constant temperatures up to one week showed that the eggs held for 7 days at 30°F were higher in quality than eggs held for one day at 60°F. Eggs held 7 days at 60°F were higher in quality than eggs held one day at 90°F. Economic implications of this study are presented.—*G. W. Newell.* (Biological Abstracts)

HANNAN, R. S., H. J. SHEPHERD, and **D .H. SHRIMPTON.** (U. Cambridge, Eng.)
THE COOLING AND STORAGE OF TABLE POULTRY. *World's Poultry Sci. Jour. 13(1):* 4-10. 1957.—Three and 6 lb. carcasses cooled more rapidly in ice water than in circulating air even when the air moved at 550 ft. per minute. Cooling by contact with a cold plate or pipe was about equal to slowly moving air. Air cooling resulted in 0.3% weight loss while dry plucked carcasses gained 3.5% when cooled in water. Storage time before spoiling was about 5 times as long at 1°C as at 15°C, either for eviscerated or uneviscerated poultry (2-6 days at 15° and 12-31 days at 1°). Uneviscerated carcasses remained fresh up to 17 days longer than eviscerated, both stored at 1°.—*J. B. Christiansen.* (Biological Abstracts)

KORSLUND, H. J., W. W. MARION, and **W. J. STADELMAN.** (Purdue U., Lafayette, Indiana.)
SOME FACTORS AFFECTING QUALITY LOSS IN SHELL EGGS. *Poultry Sci. 36(2):* 338-340. 1957.—The effect of washing and oiling shell eggs on weight loss and change in albumen quality during 2 weeks' storage at 4 humidities at each of 2 temperatures was studied. Two experiments, of different designs, were conducted. In the first, time of production was confounded with treatment effects; the second experiment was designed to overcome this confounding. Washing of eggs did not affect weight loss significantly. The relative humidity of the storage area had no economically significant effect on albumen quality as expressed in Haugh units. In the second experiment, humidity had a statistically significant effect with high humidity being more beneficial in maintaining almumen quality. Oiling of shell eggs resulted in a significantly higher interior quality as compared to washed eggs and non-treated eggs.—Auth. summ. (Biological Abstracts)

MERCURI, A. J., J. E. THOMSON, J. D. ROWAN, and **K. NORRIS.** (U. S. Dept. Agric. Beltsville, Md.)
USE OF THE AUTOMATIC GREEN-ROT DETECTOR TO IMPROVE THE QUALITY OF LIQUID EGG. *Food Technol. 11(7):* 374-377. 1957.—Evaluation of an electronic device for detecting fluorescent ("green rot") shell eggs was made in a commercial egg-breaking plant. Automatic detection and removal of fluorescent shell eggs from commercial breaking stocks as a supplement to organoleptic examination of opened eggs resulted in significantly lower bacteria counts in liquid egg products, i.e., albumen, yolk and mix, than when organoleptic examination alone was made. This was true in the summer (July) and spring (April) although results suggested that sources of contamination other than green rots are of greater importance in the warmer months. The incidence of green rots in this study was calculated to be quite low (0.3%), indicating that very few green rots per case of eggs may suffice to markedly increase the bacterial counts of liquid egg products, emphasizing the value of removing such eggs from commercial breaking stocks.—*A. J. Mercuri.* (Biological Abstracts)

REESE, H. VAUGHN, CHARLES W. NAGEL, F. MILES SAWYER, and **GEORGE F. STEWART.** (U. California, Davis.)
ANTIBIOTICS IN POULTRY MEAT PRESERVATION: A COMPARISON OF THE TETRACYCLINES. *Food Technol. 11(8):* 426-429. 1957.—Comparison was made of the effectiveness of 3 tetracycline antibiotics for improving the storage life of chilled poultry. Six trials were made under commercial conditions. Eviscerated fryers were chilled for 2 hours in ice slush containing 20 ppm of the antibiotic. Samples of fryers were cut-up, tray-packed, and plastic film wrapped on the packing line in the plant, or were packaged as whole birds in polyethylene bags. Antibiotic-treated and untreated fryers were stored at 7.2°C (45°F.) Oxytetracycline treatment increased storage life in 3 of 6 trials, chloretetracycline in 5 trials, and tetracycline in all 6 trials. Increases in storage life ranged from 0-3 days. Whole birds kept much better than those which were cut-up. Total bacterial count per sq. inch of surface was not always a reliable index of quality.—Authors. (Biological Abstracts)

SEAMAN, ALAN. (U. Nottingham, England.)
AN ENZYMATIC FAULT OF EGG YOLKS. *Poultry Sci. 36(3):* 669-671. 1957.—The defect consists of dark spots in the yolk, or dark zones concentric with the germinal disc. There is a marked statistical correlation between the appearance of the defect and the ability of the egg yolks to clear tributyrin agar. It is suggested that small amounts of lipase may normally be present and that the defect arises from an increase of enzymic activity.—*Alan Seaman.* (Biological Abstracts)

SIMKISS, K. and **C. TYLER.**
A HISTOCHEMICAL STUDY OF THE ORGANIC MATRIX OF HEN EGG-SHELLS. *Quart. J. Microscop. Sci.*, 1957, *98*, 19-28. [Dept. Agric. Chem., Univ. Reading.]—The organic matrix of the shell of eggs was found to contain some protein with acid mucopolysaccharide. The mucopolysaccharide was liberated by pepsin, but not by trypsin. It appeared to be mucoitin sulphuric acid. The complex resembles collagen, but is probably not collagen, for the protein part is low in hydroxyproline. The mammillae differed from the shell matrix; they contained much fat and a reducing substance not present in the matrix. They were also richer in protein. The relation of the organic composition to the process of calcification is discussed. (Nutrition Abstracts and Reviews)

STADELMAN, W. J., J. V. SPENCER, E. A. SAUTER, and **M. V. WAANANEN.** (State Coll. Washington, Pullman.)
EGG PREFERENCES OF SPOKANE CONSUMERS. *Poultry Sci. 36(3):* 596-601. 1957.—Sixty consuming units in Spokane, Washington were supplied with eggs of known quality for 12 weeks to determine the range of acceptability and reaction to variations from high to low interior quality. The average of all acceptable eggs was 55.7 Haugh Units. Complaints were received on 29% of all eggs used. The greatest number of complaints concerned albumen, yolk and blood spots. Selections from photographs and plastic models indicated a preference for AA and A quality. How meaningful are our present grading standards and how satisfactory is the Haugh unit as a measure of egg quality are questions raised.—Auth. summ. (Biological Abstracts)

STRAIN, J. H. (Dominion Expl. Farm, Morden, Manitoba, Canada), and **A. S. JOHNSON.**
SEASONAL, STRAIN AND HATCH EFFECTS ON EGG QUALITY TRAITS. *Poultry Sci. 36(3):* 539-546. 1957.—Egg quality of 8514 eggs from 3 hatches of 3 strains of White Leghorns was sampled in Oct., Feb., and June 1954-55. In addition, the blood and meat spot incidence of all eggs laid (a total of 63,192) by the third hatch was observed from Oct. to Aug. Albumen quality differed significantly between strains and hatches in all 3 periods, with a strain-hatch interaction in Oct. Egg weight differences between hatches were significant in all 3 periods, strain differences disappeared in June. A strain-hatch interaction was also evident. Specific gravity differed between strains and hatches with a strain-hatch interaction early in the season but only strain differences persisted to Feb. Blood and meat spot incidence showed similar seasonal trends with a peak in March. Variations in blood spots between strains, seasonal periods, and interactions between strain and size and period and size were highly significant. A significant negative regression of blood spot incidence on clutch position was observed.—*J. H. Strain.* (Biological Abstracts)

TAYLOR, J. H. and **ELIZABETH A. WALKER.** (Cyanamid Prod. Limited, London, W. C. 2)
ANTIBIOTICS IN THE PRESERVATION OF POULTRY. *World's Poultry Sci. Jour. 13(1):* 11-18. 1957.—This review indicates that chlorotetracyclene is absorbed best by the skin and superficial tissues at low temperatures, is quickly destroyed in these tissues by cooking 15-30 minutes, is preserved there by low temperature storage, and prolongs the shelf life at 2.2°C, for about a week, with chicken halves. Dipping in 10 ppm chlorotetracyclene for 10 minutes provided nearly maximum effect.—*J. B. Christiansen.* (Biological Abstracts)

van den BERG, and **C. P. LENTZ.** (Div. Appl. Biol., Natl. Res. Council, Ottawa, Canada.)
FACTORS AFFECTING FREEZING RATES OF POULTRY IMMERSED IN LIQUID. *Food Technol. 11(7):* 377-380. 1957.—Freezing tests made with gelatin models having thermal properties similar to those of poultry were made with 4 levels of agitation in each of 5 different liquids at —20°F. Additional tests of 0°F and —40°F

were made to study the effect of temperature on freezing time. Freezing times varied with agitation by a factor of 1.5 to 2 and with type of liquid by a factor of 2 or more, depending mainly on viscosity. Freezing times were approximately inversely proportional to difference between liquid temperature and freezing point of the material. Packaging and size and initial temperature of model affected freezing times significantly, the magnitude of the effect depending on depth in the model and agitation rate.—Authors. (Biological Abstracts)

MANAGEMENT

BUSS, EDWARD GEORGE. (Purdue U., Lafayette, Indiana.)
SOME FACTORS WHICH AFFECT HATCHABILITY OF CHICKEN EGGS AT HIGHER ALTITUDE. *Dissertation Absts. 16(11):* 1979-1980. 1956. (Biological Abstracts)

BYERLY, THEODORE C. (Agric. Res. Serv., US Dept. Agric., Washington, D. C.)
LIGHT AND EGG PRODUCTION. *Poultry Sci. 36(3):* 465-468. 1957.—The rate of egg production of pullets during their first laying year may be described by the following equation:

$$R = A + B \log_{10} X + CY + DZ$$

R is monthly rate of egg production in per cent, A, B, C, and D are constants determined by least squares, $\log_{10} X$ is the logarithm of the daily light period in hours, Y is the length of daily dark period in hours, and Z is the time in months since laying started. Under constant environment, rate of production tends to fall in proportion to elapsed time after first egg. Rate of egg production is proportional to daily light period and to daily dark period so that a maximum rate is reached with a daily period of illumination of about 13-14 hours. There are wide individual differences with respect to minimal daily light periods required for egg production and individual response to increase in length of daily light periods.—*T. C. Byerly.* (Biological Abstracts)

FRONDA, F. M., and **A. C. CAMPOS.** 1955. (Dept. Anim. Husb., Univ. Philippines, Laguna.)
TYPES OF LAYING HOUSES FOR THE FARM. *Philipp. Agric., 39:* 40-47.—To find the most suitable conditions for housing hens in the Philippines, 4 groups each of 30 S.C. White Leghorn pullets just beginning to lay were placed in different types of laying house. One was open on all sides, 2 were partially walled, and the 4th was the conventional type with 3 sides walled from ground to roof. Egg production was best in one of the partially walled houses (194.0 eggs per bird) and poorest in the conventional-type house (124.7 eggs per bird). Mortality ranged from 10% to 26.7% and could not be related to type of house used. (Animal Breeding Abstracts)

GETTY, J.
TURKEY DEMONSTRATIONS. PARKHEAD POULTRY UNIT. *Scottish Agric. 36(3):* 138-142. Illus. 1956[1957].—Trials were set up in North Scotland to test effect of methods of rearing poults—floor brooders, tier brooders and hay box brooders—with a follow-up in fold units vs. free range, the fold unit producing heavier birds. The advantages of range woodland and pole barn shelters are discussed and details are given of experimental feeds, where sorghum as the cereal in a mixture gave the heaviest yield. Penicillin at 10 g/ton of food increased the live weight.—*C. E. Foister.* (Biological Abstracts)

HART, SAMUEL A., WILBOR O. WILSON, and **ALLEN E. WOODARD.** (U. California, Davis.)
THE VALUE OF WINDBREAKS FOR WINTER PROTECTION OF CHICKENS IN CALIFORNIA CAGE HOUSES. *Poultry Sci. 36(3):* 662-669. 1957.—During 3 consecutive winters laying pullets were

kept in cage houses with and without windbreaks. Experiments were designed (1) to measure the caged laying hen's response to partial wind control as affected by lath windbreaks, and (2) to measure the actual climatic modification that lath windbreaks provide. Egg production benefited from wind protection given to the birds by slatted lath windbreaks. The outside air velocity was reduced by the house and equipment to a considerable extent even without windbreaks. The wind inside the house was reduced to 28-57% of the outside air velocity. Windbreaks further reduced the wind inside the house to a velocity of only 6-15% of the outside air velocity.—*W. O. Wilson.* (Biological Abstracts)

HOYT, C. C. and **L. E. DAWSON.**
COST OF RAISING PULLETS ON SEVEN MICHIGAN FARMS. *Quart. Bull. Michigan Agric. Exp. Stat.*, 1956, *38*, 493-499.—The flocks studied ranged in size from 70 to 1700 birds. The biggest item in the cost of raising replacement pullets for the laying flocks was feed, 46 per cent of the total. Labour, 21 per cent, was next, and the cost of purchasing the chicks was 19 per cent.

The cost of feeding depended to some extent on management and could in some cases have been reduced. The relation between mortality and cost of rearing was not close, but adequate floor space and prophylactic medication where necessary are recommended to reduce losses. Lower cost of chicks did not mean higher net profit, since the more expensive birds were of better quality. Breed had only a small effect, less than management, on total cost; light breeds were more economical on the whole than heavy. The cost of labour per bird decreased as the size of the flock increased, and management was of first importance in this. (Nutrition Abstracts and Reviews)

HUSTON, TILL M. (U. Georgia, Athens), **JACK R. PALMER,** and **JAMES L. CARMON.**
THE EFFECTS OF WASHING ON THE HATCHABILITY OF HEN EGGS. *Poultry Sci. 36(3):* 557-562. 1957.—Fourteen hatches involving more than 17,000 eggs were made over the duration of a year. In one trial, in which the only soiled eggs used were those dirtied in the nest, the hatcability of clean eggs was significantly higher than the hatchability of dirty eggs. It was suggested that the apparent difference in fertility resulted from a greater incidence of embryonic mortality in washed eggs, undetectable by normal candling procedures. Further tests did not corroborate these results. In succeeding trials there was no significant difference in fertility, hatchability or number of dead germs between treatments. Results from this study indicate that properly washed clean or dirty eggs hatch as well as unwashed eggs.—Auth. summ. (Biological Abstracts)

LATORRE, LUIS. Instalaciones para patos en baterias.
BATTERIES FOR DUCKS. *Arch. Zootecnia 6(21):* 37. Illus. 1957 —A type of battery in which ducks can be kept is described and illustrated by way of sketches and plans. It is especially designed for use in subtropical climates.—*D. F. Watson.* (Biological Abstracts)

LONSDALE, M. B., R. M. VONDELL, and **R. C. RINGROSE.** (U. New Hampshire, Durham.)
DEBEAKING AT ONE DAY OF AGE AND THE FEEDING OF PELLETS TO BROILER CHICKENS. *Poultry Sci. 36(3):* 565-571. 1957.—Debeaking by one-third removal of the maxilla and mandible had no significant effect upon growth or feed conversion; differences that did exist were in favor of the non-debeaked chickens. Removal of two-thirds of the maxilla and mandible reduced growth significantly. The feeding of pellets increased weight significantly over the feeding of mash, however, feed conversion was not improved. There was an interaction between treatment and form of diet in which the differences as a result of debeaking were greater with the pellet feeding.—Auth. summ. (Biological Abstracts)

MELJUKOV, A. N. 1957. Oblucenie kur eritemnymi ljuminescentnymi lampami.

THE ILLUMINATION OF HENS BY RED LUMINESCENT LAMPS. *Pticevodstvo, 7(3):* 42-44.—To compensate for the lack of ultraviolet rays penetrating the henhouses in winter, in March-April 1956 one of 2 groups each of 150 hens was subjected to the light of red luminescent lamps for 7 hrs. daily. The production of the experimental group increased to an average of 50-56.8 eggs *v.* 29.8 for the controls. There was no mortality in the experimental groups *v.* 2.1% in the controls. Shell defects which occurred frequently in the pre-experimental period did not occur during the experimental period. In a further experiment from Nov. 1955 to April 1956 there were 299 experimental and 379 control hens. The egg production of the former was 15-32% higher and egg weight was greater than those of the latter. The hatchability rate of eggs of experimental hens was 91.8% *v.* 86.6% for those of the controls. (Animal Breeding Abstracts)

NEW, D. A. T. (Dept. Anat., Univ. Coll. London.)

A CRITICAL PERIOD FOR THE TURNING OF HEN'S EGGS. *Jour. Embryol. and Exptl. Morphol. 5(3):* 293-299. 1957.—Turning hen's eggs between the 4th and 7th day of incubation gives a hatchability similar to that of eggs turned throughout incubation. Turning the eggs between the 8th and 11th day gives a hatchability similar to that of untreated eggs. New evidence is presented that absence of turning leads to abnormal adhesion between the chorion and shell membranes, and the mechanism by which turning effects development is discussed.—Auth. abst. (Biological Abstracts)

VAN VAERENBERGH, R. Les volières à litière permanente dans la lutte contre les maladies des volailles.

POULTRY HOUSES WITH DEEP LITTER IN THE FIGHT AGAINST POULTRY DISEASES. *Bull. Agric. Congo belg.*, 1957, *48*, 87-99. [Div. Zootech INEAC.] Flemish summary.—Poultry kept by the native population under extensive conditions do not suffer much from infective and parasitic disease. European poultry keepers suffer serious losses. Specially constructed sheds with deep litter, or batteries, are recommended to reduce the losses. (Nutrition Abstracts and Reviews)

WILSON, WILBOR O., SAMUEL A. HART, and ALLEN E. WOODARD. (U. California, Davis.)

MIST COOLING HENS IN CAGES BY FOGGING. *Poultry Sci.* 36(3): 606-613. 1957.—The effect of cooling laying hens in open cage houses with water was studied for 3 consecutive summers. Several days each year the maximum temperature was in excess of 100°F. A diurnal variation of about 40° was seen. Under the climatic conditions that prevailed, mist cooling with foggers eliminated mortality from heat prostration. The rate of egg production of survivors, egg weight and egg shell thickness was not improved over the control by the use of mist cooling. —*W. O. Wilson.* (Biological Abstracts)

GENERAL

EL-HASSANY, M.

POULTRY INDUSTRY OF LEBANON. *World's Poultry Sci. Jour., 13(1):* 19-20. 1957.—High cost of imported feed, especially animal protein necessitates use of home grown ingredients providing submaximum production. The government owns Terbol experimental farm and 6 demonstration farms. There are 15 private modern farms with capacities of more than 2500 birds.—*J. B. Christiansen.* (Biological Abstracts)

EL-SOSI, ANIS J., and **GEORGE B. McLEROY.** (Abu Ghraib Agric. Coll., Iraq.)
THE CHICKEN INDUSTRY OF IRAQ. *World's Poultry Sci. Jour. 12(3):* 188-205. 1956.—Individual commercial farms have operated occasionally since 1905, but the industry is not organized. Annual production is not over 80 eggs, large and brown, in the northern areas. In the central and south averages increase to 150 eggs, but about 60% of the 7-8 million chickens are in the northern third of the country. The native Haraty chicken is similar to the Cornish and used for cock fighting. The native Irani chickens have featherless necks. Iraqui and Kochi are the same breed. Chickens are raised by 80% of the families in Mosul. Baghad is the largest market. Palestine is the chief egg market. —*J. B. Christiansen.* (Biological Abstracts)

JULL, MORLEY A. (Amer. Embassy, Rome, Italy.)
ITALY'S EXPANDING POULTRY INDUSTRY. *World's Poultry Sci. Jour. 13(1):* 26-28. 1957.—There are about 80 million layers which produced 6 billion eggs. Three million broiler chicks were imported and 160 thousand metric tons of poultry meat were produced.—*J. B. Christiansen.* (Biological Abstracts)

JULL, MORLEY A. (Amer. Embassy, Athens, Greece.)
MORE EGGS AND POULTRY MEAT NEEDED IN DIETS FOR GREECE'S RAPIDLY INCREASING POPULATION. *World's Poultry Sci. Jour. 13(1):* 31-36. 1957.—Poultry constitutes about 11% of the total meat production. Commercial flocks near the larger cities about double the average production per bird in farm flocks in the same area. Individual breeders are conducting progeny-testing programs. Most poultry diseases are present, with leukosis being the most serious.—*J. B. Christiansen.* (Biological Abstracts)

KING, A. S., and **P. M. BIGGS.** (Bristol U., England.)
GENERAL ANAESTHESIA IN G. DOMESTICUS FOR NON-SURVIVAL LABORATORY EXPERIMENTS. *Poultry Sci. 36*(3): 490-495. 1957.—Intravenous urethane was developed as a general anesthetic for *Gallus.* Up to 9 hours of continuous anesthesia were obtained by a 43% aqueous solution. The minute anesthetic dose was about 1.5 g/kg, the safety margin being great. Respiration was depressed, but probably less than by barbiturates. For non-surival experiments the method is thought to be superior to all others, unless a high arterial pressure is essential.—*A. S. King.* (Biological Abstracts)

WEISS, HAROLD S. (Rutgers U., New Brunswick, N. J.)
FURTHER COMMENTS ON THE EFFECT OF NICARBAZIN ON THE EGG. *Poultry Sci. 36(3):* 589-591. 1957.—The drug was fed at the 0.0125% level for 10-15 days to small groups of White Rock and White Leghorn pullets and to hybrid hens laying tinted eggs. Brown and tinted eggs were whitened after 3 days of treatment. Egg production was reduced an average of 8% and egg weight an average of 5% from control levels. Shell thickness and albumen score were unaffected. Considerable variation existed among the 3 groups of birds in the severity of the production and weight effects, being almost negligible in the hybrids. Yolk mottling, estimated in the White Leghorns only, reached possibly serious levels in the freshly laid egg of only 1 of 9 treated birds.—*H. S. Weiss.* (Biological Abstracts)

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F. E. Binet, c/o CSIRO Poultry Research Centre, Werribee, Victoria
F. R. Bird, P.O. Box S. 98, Wagga Wagga, N.S.W.
A. E. Blake, 407 Whitehorse Rd., Balwyn, Victoria
P. Boughen, P.O. Box 79, Salisbury, S. Australia
V. H. Brann, Dept. of Agr., Farrer Place, Sydney, N.S.W.
H. Brazil, Beaudesert Road, Coopers Plains, Brisbane, Queensland
J. Broadbent, 150 Lake Road, Wallsend, N.S.W.
H. A. Brook, 727 South Road, Edwardstown, S. Australia
W. H. Bruce, Windsor Road, Baulkham Hills, N.S.W.
D. G. Bryant, 9 Pietro Rd., Heat Herton, Victoria
N. L. Bull, Dunguwan, via Tamworth, N.S.W. (Life Member)

W. Burns, "Hillside", Blacktown Road, Blacktown, N.S.W.
H. W. Burton, Animal Research Station, Sherwood Road, Rocklea, Queensland
A. C. N. Butcher, 12 Hicks St., Gosnells, Western Australia (Life Member)
F. A. Campbell, Albany Creek, Aspley, Brisbane, Queensland
M. Campbell, Albany Creek, Aspley, Queensland
H. R. Carne, Dept. Vet. Path. & Bact., Univ. of Sydney, City Road, Glebe, Sydney, N.S.W.
R. J. Carter, Wynton Poultry Farm, Eva St., Maddington, West Australia
R. S. Carter, "Sunnyridge", Shakel Road, Menai, via Sutherland, N.S.W.
Air Vice-Marshall J. R. Cassidy, Coolabah Stud Poultry Farm, Grantham Rd., Seven Hills, N.S.W.
A. Charlton, Spring Road, Kenwick, W. Australia
H. G. Christie, "Dunbar", Sobraon Road, Eastwood, N.S.W.
R. Clark, Tarnella Poultry Farm, Woodhouse Grove, Box Hill, Victoria
P. Q. Clayton, Box 30, Shepparton East, Victoria
D. Clinton, 53 Cranley St., Toowoomba
J. R. Cole, 274 Findon Road, Findon, S. Australia
R. B. Corbett, Woombye, Queensland
C. A. Corsellis, Editor, "Poultry", P.O. Box 9, Haymarket, Sydney
K. M. Cowin, Spring Rd., Kenwick, Western Australia
B. A. Cosgrove, Clear Mountain Rd., Aspley, Brislane, Queensland
F. J. Culell, c/o "Raemair" Hatchery, Lower Dandenong Rd., Braeside, Victoria
H. A. Cunneen, Queensland Agric. College, Lawes, Queensland
O. J. Cusack, Q. A. H. Society, Lawes, Queensland
J. Darling, 31 Macquarie Street, Sydney, N.S.W. (Life Member)
L. A. Davies, 5 Altona St., Abbotsford, N.S.W.
R. G. Davies, Centre Dandenong Rd., Cheltenham, Victoria
J. A. Dobson, Morayfield, Queensland
I. Donald, Underwood Road, Eight Mile Plains, Queensland
C. Donnelley, Gladston Hatchery, Wentworthville, N.S.W.
E. Dorney, 20 Norseman Ave., Westbourne Park, S. Australia
R. W. Druce, 207 Old Prospect Road, Wentworthville, N.S.W.
D. C. Duncan, Poultry Experiment Station, Seven Hills, N.S.W.
G. Edgar, Veterinary Research Station, Glenfield, N.S.W.
Mrs. M. I. Edgley, Chetwyn Park, Humphries Road, Frankston, Victoria
H. H. Eggleton, "Chesington", Bartlett Avenue, Croydon, Victoria
P. Ellis, Bulla Rd., Tullamarine
J. W. Evans, 12 Chelmsford Avenue, Epping, N.S.W.
F. Findlay, Hillcrest Ave., Eltham, Victoria
A. J. Flack, Williams Road, Horsham, Victoria
M. Freeman, c/o Robert Hutchinson, Ltd., Hartington St., Glenroy, W. 9, Victoria
K. Fry, Box 106, Bathurst, N.S.W.
L. Gaffney, 94 Holmfirth Street, Mount Lawley, W. Australia
E. E. Gallus, Centre Road, Vermont, Victoria
T. V. Gameau, 71 Findon Road, Woodville, S. Australia
A. George, Duffy Ave., Thornleigh, N.S.W.
A. Giles, "Bonaventure", Mount Druitt, N.S.W.
G. L. Gill, Main Road, Tecoma, Victoria
J. S. Gill, Smiths Lane, Templestowe, Victoria
K. H. Gisler, Brisbane Road, Wynum, Brisbane, Queensland
E. A. Goldrick, 35 Pretoria Parade, Hornsby, N.S.W.
A. C. Goodier, 18 Fitzgerald Rd., Ermington, N.S.W.
H. M. Goulter, Granite Belt Poultry Club, The Summit, Queensland
G. W. Grenville, Springvale Road, Springvale, Victoria
J. H. Gulliford, Hawkesburg Agr. Coll., Richmond, N.S.W.
A. G. Haines, Willaston, S. Australia
D. J. Hall, c/o Egg Mktg. Board of N.S.W., P.O. Box 43, Lidcombe, N.S.W., Australia

H. Hall, "Melbury Lea Farm", Narre Warren Road, Narre Warren North, Victoria
M. D. Hall, Deptment of Agriculture, Treasury Gardens, Melbourne, Victoria
T. Hallick, Box 6, Caboolture, Queensland
W. Halliday, Grand View Road, New Lambton Heights, N.S.W.
A. Hampton, Scott Street, Kewdale, W. Australia
J. G. Hardy, Carawa Rd., Dee Why West, N.S.W.
L. D. Hardy, Cathies Lane, Scoresby, Victoria
E. C. Harris, Wingview Poultry Farm, Box 20, Hahndorf, So. Australia
E. M. Hart, Harts Breeding Farms, Railway Rd., St. Marys, N.S.W., Australia
J. S. Hartley, Dept. Agr., P.O. Box 407, Launceston, Tasmania
S. Hawgood, 204 Pinelands Rd., Sunnybank, Queensland
O. Heaps, Bulla Road, Tullamarine, Victoria, (Life Member)
J. G. Heathfield, 26 Greystones Rd., Pendle Hill, N.S.W.
J. Hetherington, 23 Rawson Rd., Fairfield West, N.S.W.
B. Hill, High St., c/o L. Dugdale, East Murchison, Victoria
T. E. Hills, Sims Road, Bundaberg, Queensland
Mrs. G. Hocking, 22 Sherbrooke Ave., Ringwood, Victoria
T. H. Hodgson, Everlay Stud Poultry Farm, Menangle, N.S.W.
W. C. Hoey, c/o Clark King & Co. Pty. Ltd., 237 Queen Street, Melbourne, Victoria
H. Hufschmid, Elison Road, Geebung, Queensland
C. Hughes, 11 Ferrar St., Mount Lawley, Western Australia
T. G. Hungerford, 585 High St., Penrith, N.S.W.
S. Hunt, Bio. Inst. of Australasia Pty. Ltd., 17 Botany St., Randwick, N.S.W.
S. E. Hunt, Pacific Highway, Slacks Green, Queensland
C. A. Hurst, New Street, Eltham, Victoria
H. M. Hutchinson, 144 Clynde Road, Hectorville, S. Australia
J. C. D. Hutchinson, Sheep Biology Laboratory, P.O. Box 144, Paramatta, N.S.W.
W. F. Hutchinson, 71 Black St., Milton, Brisbane, Queensland
E. J. Ikin, 44 Mackay St., Seddon W13, Victoria
H. J. Ingham, Box 4, Post Office, Liverpool, N.S.W. (Life Member)
A. Jellinek, Yan Yean Road, Plenty, Victoria
A. W. Jenner, 14 Kuran St., Chermside, Queensland
H. Just, Niagara Park, via Gosford, N.S.W.
J. E. Keenan, Meadowlands Road, Carina S.E. 7, Brisbane, Queensland, (Life Member)
M. Kidston, Poultry Farmers Coop. Soc. Ltd., Box No. 743 K. Red Comb House, Roma St., Brisbane
S. M. Kimpton, 395 Collins St., Melbourne, Victoria
C. H. King, "Rowbotham", Toowoomba. Queensland
K. S. Kirby, 772 Manly Rd., Tingalpa, Brisbane, Queensland
E. C. Knoblaugh, "Lucinda Park", Logan Rd., Mt. Gravatt, Brisbane, Queensland
C. Kostos, c/o Kostos Bros. Poultry Farm, Waverly Rd., Chadstone, Victoria
F. A. Langley, 342 Torrens Road, Croydon, S. Australia
G. E. Lax, Pinklands Cleveland, Queensland
S. S. Leach, R. M. B. 26, Windsor Rd., Baulkham Hills, N.S.W.
C. LeGras, 30 Park St., Sydney, N.S.W.
D. R. Lenton, 33 Harris St., Balmain, N.S.W.
R. A. Lewis, 2 Burrows Street, Stafford, Queensland
M. Lindtner, 14 Eastview St., Wollstoncraft, Sydney, N.S.W.
S. Lingard, Buderim, Queensland
F. Lister, c/o Nicholas Proprietary Ltd., 40 Clarence St., Sydney, N.S.W.
A. J. Lockett, The Oaks, Camden, N.S.W.
A. H. Lofts, 20 Pretoria St., Zillmere, Queensland
J. N. Love, c/o Millmaster Feeds Poultry Ltd., Braidwood St., Enfield, N.S.W.

G. C. Loveday, Peachester, Queensland
G. Lucas, Liverpool Road, Killsyth, Victoria
B. T. Lynch, 16 Hillcrest Rd., Pennant Hills, N.S.W.
D. Lynch, c/o Poultry Farmers Coop. Soc. Ltd., Box 743K, GPO Brisbane, Queensland
C. S. Lynott, Plenty Lane, Greensborough, Victoria
R. A. S. Macalister, Braeview Stud Poultry Farm, Gawler Rail Post Office, S. Australia
W. E. Macauley, Burnley Gardens, Burnley E.1, Victoria
R. V. Macgregor, Uranium St., Kewdale, Western Australia
R. N. Macindoe, Poultry Section, Hawkesbury Agr. Coll., Richmond, N.S.W.
R. Mackley, Foote St., Templestow, Victoria
P. F. Magee, The Esplanade, French's Forest, Sydney, N.S.W.
F. Maher, c/o Hamilcar Holdings Pty., Ltd., Siddeley St., West Melbourne, Victoria. (Life Member)
R. P. B. Markwell, P. O. Box 23, Caboolture, N.C. Line, Queensland
H. M. Marsden, Cr. Bayswater & Wattle Roads, Baywater, Victoria
D. C. Marychurch, 31 Fawkner St., St. Kilda, Victoria
R. Matthews, c/o "The Weekly Times", 44 Flinders St., Melbourne, Victoria
A. A. McArdle, 90 Gladstone Road, Brighton, S. Australia
I. R. McCann, Crowlands Road, Stawell, Victoria
G. L. McClymont, University of New England, Armidale, N.S.W.
M. W. McDonald, Poultry Experiment Station, Seven Hills, N.S.W.
J. J. McLachlan, Dept. of Agriculture & Stock, Townsville, Queensland
K. F. Millar, Markwell Rd., Caboolture, N. C. Line, Queensland
F. N. J. Milne, Poultry Branch, Dept. Agr. & Stock, William St., Brisbane, Queensland
B. A. Milroy, 47 Bolivar St., Terang, Victoria
A. Moffatt, Redlands Rd., Upper Mt. Gravatt, Queensland
B. W. Moffatt, Cr. Crawford & Appel Sts., Chelmer, Brisbane, Queensland
A. O. Moll, 89 Quay Street, Sydney, N.S.W. (Life Member)
R. H. Morris, Dept. of Agriculture, St. Georges Terrace, Perth, W. Australia
F. P. Munzberg, Box 166, Tanunda, S. Australia
R. Murdoch, 89-91 Quay St., Sydney, N.S.W.
J. M. Musgrove, 16 Wellington Ave., Blackburn, Victoria
L. R. Neil, 24 Charlotte St., Wavell Hgts., Brisbane, Queensland
P. Nemet, Springvale Road, Springvale South, Victoria
G. H. Neve, Lot 12, Wattle Valley Rd., Mitcham, Victoria
T. C. Newman, c/o Crago Stockfeeds Poultry Ltd., Gladstone St., Newtown, N.S.W.
L. G. Newton, 12 Grosvenor St., Yeerongpilly, Brisbane, Queensland
A. J. Nichol, Paradise Poultry Farm, Gunnedah, N.S.W.
W. H. Nosworthy, 48 Gnarbo Ave., Blakehurst, N.S.W.
G. E. Orange, 22 Princes Highway, Albion Park 6C, N.S.W.
A. W. Oughton, Forrestfield, W. Australia
A. Outridge, c/o Queensland Dept. Agr. & Stock, Bundaberg, Queensland
W. D. Pederick, Norman Lodge, Mt. Eliza, South Victoria
T. H. Pettigrove, Fulton Road, Blackburn South, Victoria
H. Pike, Corrigan Rd., Noble Park, Victoria
P. R. Pike, 501A, Old South Head Rd., Rose Bay, Sydney, N.S.W.
N. Pitt, Pitts Breeding Farms, Bundaberg, Queensland
B. Plaude, Hill Rd., West Pennant Hills, N.S.W.
L. S. Plumstead, "Redleaf", Greens Rd., Dundas, N.S.W.
W. H. Prowse, 8 Frank St., Doncaster, Victoria
W. J. Pryor, c/o Nicholas P/L, 37 Swanston St., Melbourne, Victoria
K. D. Pugh, 61 Pear St., Greenslopes, Brisbane, Queensland
F. Ray, Wallsend Road, Cardiff, N.S.W.
J. Renno, Belldale, N.S.W.

T. Richardson, 448 Brisbane Road, Wynnum, Queensland
H. G. Ridgway, 7 Westminster St., Gladesville, N.S.W.
W. Roantree, 47 Eaton St., Clarence Park, S. Australia
D. J. Robinson, c/o Annand Robinson & Co., 282 Ruthyen St., Toowoomba, Queensland
M. Robinson, I.C.I.A.N.Z., 529, Lonsdale St., Melbourne
T. J. Robinson, Dept. of Animal Husbandry, Universitv of Sydney, City Road, Glebe, N.S.W.
S. Rogers, 82 James St., Dandenong, Victoria
A. Rose, 7 New Zealand Ave., Parramatta, N.S.W.
P. Rumball, Messines Ridge Rd., Holland Pk., Brisbane, Queensland (Life Member)
D. G. Ryan, Junction Road, Nunawading, Victoria
P. A. Ryan, P.O. Box 6, Rozelle, N.S.W.
J. W. Ryley, Animal Research Institute, Yeerongpilly, Brisbane, Queensland
W. Schneeberger, c/o Tone-All Supply Pty. Ltd., Concord Ave., Concord West, N.S.W.
W. Shale, Hemmant Rd., Tingalpa, Brisbane, Queensland
L. E. Shannon, 30 East Crescent, Hurstville, N.S.W.
G. D. Shaw, 71 Leake Street, Belmont, W. Australia
B. Sinkovic, Veterinary Research Station, Glenfield, N.S.W.
F. Skaller, C.S.I.R.O., Poultry Research Centre, Werribee, Victoria
E. Skett, Hoetter St., Toowoomba, Queensland
R. E. Slaughter, Beams Rd., Aspley, Brisbane, Queensland
P. Smetana, Hector St., Tuart Hill, W. Australia
B. Smith, Bradley Lodge, Windsor Road, Baulkham Hills, N.S.W.
C. J. Smith, "Greenless", Old Northern Road, Dural, N.S.W.
G. W. Smith, 40 Ashburner St., Manly, Sydney, N.S.W.
J. P. C. Smith, Department of Agriculture, Parramatta, N.S.W.
W. E. Smith, 19 Storey Road, Reservoir, N. 19, Victoria
S. C. Spencer, Rose Cottage, Dural, N.S.W.
F. Spicer, 66 Duncan St., Wynnum West, Brisbane, Queensland
W. Stanhope, 21 Golf Links Ave., Oakleigh, Victoria
J. B. Steggles, c/o Steggles Pty. Ltd., P.O. Box 22, Newcastle West, N.S.W.
Miss I. J. Stewart, Animal Husbandry Res. Centre, Werribee, Victoria
D. A. Swift, Kangroo Flat, Victoria
B. Talbot, William Street, Greenborough, Victoria
H. L. Taylor, 180 Surrey Road, Blackburn, Victoria (Life Member)
A. A. Tegel, Heath Road, Leppington, N.S.W.
R. L. Temple, Morack Road, Vermont, Victoria
The Librarian, Dept. of Agr. & Stock, William St., Brisbane, Queensland
The Librarian-in-Charge, Dept. of Primary Industry, Canberra, A.C.T.
D. E. Tribe, School of Agr., Univ. of Melbourne, Carlton, N. 3, Victoria
C. W. Tutt, 95 Norman Crescent, Norman Park, Queensland
O. Van Stappen, Pacific Highway, Wyong, N.S.W.
A. E. Walters, 118 Ferndale St., Annerley, Brisbane, Queensland
P. E. Warren, 35 Greengate Road, Killara, N.S.W.
W. M. Watkins, 52 Price St., Edwardstowe, S. Australia
R. Watt, Balnarring, Victoria
M. Watts, 15-17 Young St., Sydney, N.S.W.
G. E. Webb, "Hartwell" RMB 123, Carter's Rd., Dural, Sydney, N.S.W.
R. M. Webb, "Winmarleigh" 64 Church St., Carlingford, N.S.W.
C. G. Welker, Oakhill Road, Pearce Dale, via Somerville, Victoria
C. W. Westwood, Derrig Road, Tennyson, via Richmond, N.S.W.
A. D. Wetherell, c/o Agr. Chem. & Equip. Pty. Ltd., P.O. Box 4, Toowong, Brisbane, Queensland
S. J. Wilkins, Div. of Animal Industries, Dept. of Agr., Farrar Place, Sydney, N.S.W.

N. T. Wilkinson, Sydenham Street, Rivervale, Western Australia
O. D. Wright, 26 Taylor St., Moonee Ponds, Victoria
M. E. Wurcker, Woolbrook Turkey Farm, Box 42, Merriwa, N.S.W.
N. A. Young, c/o Dewey & Almy Ltd., Sydney Road, Fawkner, Victoria

AUSTRIA

A. K. Halama XV Marianhilferstrasse 132, Wein
R. Schmidt, Linke Bahngasse 11, Vienna III
T. Stonborough, Kundmanngasse 19, Vienna III

BELGIAN CONGO

G. de Brier, Lusoso, Luluabourg

BELGIUM

J. Arents, Populier Straat 3, St. Lievens, Esse
G. Bohez, 47 Grote Steenweg, Olsene
H. Boudringhien, 17 Kerkstraat, Olsene
J. Camerlinckx, 48 Platteloostraat, Kessel-Lo
L. Clinckers, Vroegeinde 5, Pulle
N. C. DeRycke, 59 Stationstreet, Gavere
E. Detry, Thimister
J. De Winter, 67 Meir, Antwerp
A. Dumon, 16 Vandenbemptlaan, Heverlee Louvain
L. Geurden, Plateaustraat 24, Ghent
J. Jans, Bleekstraat 42, Mechelen
M. Jans, Leopoldstraat 31, Mechelen
M. Laga, Rechtervaartoever, Roeselare
J. Lenaerts, 137 rue de Namur, Wavre
F. C. Lievens, Rue du Meridien 3, Bruxelles
J. Nerinckx, Lindestraat 135, Herne
F. Okerman, Potaardeweg 2, Gontrode
M. J. J. Puype, Luikersteenweg 261, Hassett
N. Reijntens, Dorp No. 5, Gontrode
R. Snick, 23 Malou Straat, Ieper
L. Standaert, 45 Statiestraat, Landegem
M. de Sutter, Hoogstraat 53, Assenede
J. Van den Audenaerde, 29 L. Selbaan, Deurne, Antwerp
F. Van Dooren, 49 Harmoniestraat, Antwerp
G. Van Goethem, 22 Bischopstraat, Antwerp
J. Van Ingelgem, 87 Avenue des Mimosas, Woluwe St. Pierre, Brussels
L. Van Waesberghe, Sparrenhof, Meldegem
G. Verfaille, Noordkaai 1, Merksem, Antwerp
J. Wijverkens, 134 St. Rochusstraat, Hal. Brabant
A.E.R. Willems, Veterinary School, Casinoplein, 11, Ghent
R. Willems, Lab. Recherches Veterinaires, rue Groeselenberg, Uccle

BRAZIL

R. B. Costa, Rosario, 158 A, Rio de Janeiro
J. W. de Costa, Rua 13 de Maio, 817, Sao Paulo
R. M. de Miranda, Universidade Rural, Via Campo Grande, D.F., Rio de Janeiro

CANADA

J. R. Aitken, Poultry Division, Central Exp. Farm, Ottawa
Jacob Biely, Univ. of British Columbia, Vancouver
F. L. Billings, 174 Highbourne Rd., Toronto
H. D. Branion, Ontario Agr. College, Guelph
F. W. Bray, 71 S. Oval, Hamilton, Ontario
E. E. Brockelbank, Director An. Ind. Branch Sask Dept. Agr., Administration Building, Regina, Sask
Jacques de Broin, Feed Div. Purity Flour Mills Ltd., P.O. Box 1, Stn. E., Montreal 14, Que.
J. I. Brown, Canadian Produce Assoc., Box 222, Montreal
Canadian Produce Council, A. Wilson, Sec'ty-Treas., P.O. Box 924, Moose Jaw, Sask.
Mrs. D. M. Catto, Turkeys DeLuxe Reg'd., Dewittville, Quebec
J. R. Cavers, Poultry Dept., Ont. Agr. College, Guelph, Ont.

D. R. Clandinin, Poultry Division, Univ. of Alberta, Edmonton
R. H. Common, Box 223, Macdonald College, P.Q.
A. D. Davey, Poultry Services, Dept. of Agriculture, Ottawa
R. A. De Pape, Butterfield's Ltd., P.O. Box 219, Vancouver
H. B. Donovan, Jr., 214a Adelaide St. W., Toronto 1, Ont.
Donald Ells, Sec.-Treas., Cyrus & Manning Ells Ltd., Port Williams, Nova Scotia
A. E. Ferguson, Ontario Veterinary College, Guelph
H. S. Gutteridge, Chief, Poultry Division, Central Exp. Farm, Ottawa
Jacques Hardy, P.O. Box 492, Granby, Shefford, Que.
Wm. M. Hawley, Poultry Field Serv., Brackman- Ker., Box 920, New Westminster
A. T. Hill, Derreen Poultry Farm, R.R. 2, Sardis, B.C.
G. C. Hodgson, 133 Cordova St., Winnipeg, Man.
N. D. Hogg, P.O. Box 66, Station Q, Toronto
C. H. Huctwith, Forest Ont., (Life Member)
F. N. Jerome, Poultry Dept., Ontario Agricultural College, Guelph. Ont.
A. S. Johnson, Central Experimental Farm, Department of Agriculture, Ottawa
P. A. Kondra, Poultry Dept., University of Manitoba, Winnipeg, Manitoba
J. E. Lancaster, Dept. of Poultry Science, University of British Columbia, Vancouver 8
G. L. Landon, Dept. of Agriculture, Victoria, B.C.
G. S. Linblad, R.R. #1, Guelph
D. R. MacDonald, Nova Scotia Agr. Coll., Truro, Nova Scotia
W. A. Maw, Macdonald College, Quebec
Mrs. N. McCulloch, Vancouver Island Turkey Improvement Assn., Langford, P.O., V.I., B.C.
D. McLaren, 555 Brixton Ave., St. Lambert, P.Q.
R. H. McMillan, 11685-72 Ave., Edmonton, Alberta
M. S. Mitchell, Poultry Production Service, Dept. of Agr., Ottawa
W. D. Morrison, c/o Toronto Elevators Ltd., P.O. Box 370, Sta. A. Toronto
H. F. Murwin, Dominion Exp. Farm, Harrow, Ont.
J. W. Nivison, Surrey Coop. Assoc., Cloverdale, B.C.
Officer in Charge, Canada Agriculture, Experiment Station, Nappan, N.S.
Superintendent, Canada Agricultural, Experimental Farm, St. Johns West, Newfoundland
J. B. O'Neil, Poultry Dept., Univ. of Saskatchewan, Saskatoon
Ernie Peden, Scott & Peden Ltd., P.O. Drawer 939, Victoria, B.C.
R. A. Peel, Port Perry, Ont.
Harvey Pettit, Poultry Department, Ontario Agr. Coll., Guelph
J. U. Pilon, Poultry Division, Dept. of Agr. Quebec City
W. H. Pope, Poultry Branch, Dept. of Agr., Parliament Bldgs., Victoria, B.C.
R. V. Robinson, B. C. Feed Mfg. Assoc., 608, 355 Burrard St., Vancouver, B.C.
D. M. Shaver, R. R. 1, Box 194, Galt, Ont.
H. Sheinin, Sam Sheinin Limited, Third St. E., Calgary, Alberta
S. J. Slinger, Poultry Dept., Ontario Agriculture College, Guelph, Ont.
E. S. Snyder, Poultry Dept., Ontario Agr. College, Guelph
Superintendent, Canada Agriculture, Experimental Farm, Nappan, Nova Scotia
The Fisher Orchards, R.R. 2, Burlington, Ont.
Jack Tweddle, Tweddle Chick Hatcheries Ltd., St. David's St., Fergus, Ont.
H. E. Upton, Box 33, 739 Victoria Ave., White Rock, B.C.
J. P. Walker, Dept., Poultry Husbandry, Ontario Agr. College, Guelph
M. Wierner, Miller Hatcheries, 260 Main St., Winnipeg

F. Leslie Wood, Dir., Poultry Service, Dept. of Agriculture, Fredericton, N.B.

CHILE

Gazman Castro, Casilla 40, Buin
G. Junemann, Casilla 143, Chillan
C. F. Leatherbee, Casilla 1844, Santiago
J. J. San Miguel, Casilla 7025, Santiago 7

CHINA

Y. Z. Tang, P.O. Box 115, Peking

COLUMBIA

F. Gil, (G), Fontibon, D. E.
I. Gomez V., Planta Avicola, Calle 23 Norte No. 3-33, Cali (Valle)
Mrs. S. M. Hubbard, Apartado Aero 3879, Bogota
S. M. Parias, Aereo 20-97, Cali

CZECHOSLOVAKIA

Karel Herbrych, Jindrisska 5, Praha 3
Vitezslav Orel, Masna 5, Brno
Stanislav Prochazka, Gorkeho nam. 32, Praha 3
Josef Vavrousek, Sokolska 45, Praha 3
Zdenek Votava, Gorkeho nam. 32, Praha 3

DENMARK

Henning Andersen, Danmarks Aegexport A/S, 9 Stoltenbergsgade, Copenhagen
J. Baelum, Agr. Research Lab., Rolighedsvej 25, Copenhagen V
J. Bugge, Fyns Andels-Fjerkraeslagteri, Svendborg
Aage Christensen, Hoirisvej 3, Riiskov
C. Christiansen, Skalborg Kontrolhonseri, Skalberg
Dansk Andels Agexport, Axelborg, Copenhagen V
D. Davidsen, Peter Bangsvej 191, Valby, Copenhagen
Mogens Fog, Gudbjerg Skov, Gudme, Fyn
Jens Kr. Hansen, "Fiona", Holmstrup
J. Jacobsen, "Sollerup", Korinth
A. Jensen, Nordjysk Andels-Fjerkraeslagteri, Randers
A. Thoesing Joergensen, Ringsted
N. Kjaergaard, Landbrugsraadet, Axelborg, Copenhagen V
W. A. Kock, Lykkevej 9, Charlottenlund, (Honorary Life Member)
Miss Inger Larsen, Hojager, Landerslev pr. Krogstrup
Tage Larsen, Bellinge
T. Lohse, Statskontrollen med sm og Aeg, Christiansgade 22, Copenhagen
H. E. Marthedal, Lab. for Fjerkraeundersogelser, Royal Vet. & Agr. College, Bülowsvej 13, Copenhagen V
M. Kragelunds Fabrikker, Aalborg
H. Mortensen, Hoyrups Alle 1, Hellerup
E. B. Muus, Frederiksgade 2-4, Odense
O. Nielsen, Frederiksborgvej, Roskilde
E. Riisberg, 19 Bronshajvej, Copenhagen
W. Roe, A/S Kemovit, 72 Blegdamsvej, Copenhagen
C. V. Salk, Danstruplund, Fredensborg
A. Svendsen, Odense Aegforretning A/S, Rovsingsgade 90, Copenhagen N.
A. V. Tachau, Overlund, Viborg
M. W. Taylor, Agricultural Attache, British Embassy, Copenhagen
H. Thomsen, "America", Thisted
J. Traberg, Storehedinge
P. Ulrik, Jyllandsgade 155, Esbjerg
N. Vonsbaek, Fjerkraeexportundaiget, Axelborg, Copenhagen

EAST AFRICA

R. L. Thompson, Blue Hills, P.O. Box 66, Kiambu, Kenya

EGYPT

A. H. Bassiouny, Veterinary Dept., Ministry of Agr., Dokki, Cairo
Y.M.A. Eissa, Veterinary Research Inst., Dokki, Giza
M. M. El-Dine Sabry, Vet. Res. Inst., Ministry of Agr., Dokki, Cairo

H. M. El-Ibiary, College of Agr., Camp Cesar, Alexandria
A. A. El-Itriby, Animal Product Dept., Ministry of Agr., Dokki
G. A. R. Kamar, Animal Prod. Dept., Fac. Agr., Cairo University, Giza
M. H. Maghrabi, Animal Prod. Dept., Ministry of Agr., Dokki
M. A. Raafat, Animal Nutrition Dept., Faculty of Agr., Cairo University, Giza, Cairo
N. I. Shawky, Vet. Res. Dept., Dokki
Atiat Sheble, Ministry of Agr., Vet. Res. Inst., Dokki, Cairo

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S. McDonogh, Department of Agriculture, Dublin
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Miss Una O'Donoghue, The Munster Institute, Cork
D. Philpott, The Grey Door, 23 Upper Pembroke St., Dublin
B. J. Senior, Kilronan, Howth Road, Clontarf, Dublin
P. P. Walsh, 19 Laburnum Lawn, Model Farm Road, Cork

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R. H. Axworthy, The Standard Laboratory, 45 Castle St., Reading, Berkshire
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A. Buxton, Dept. of Vet. Path., The Univ., 42/44 Bedford St., North, Liverpool
J. A. Calvert, County Farm Offices, Stoke Mandeville, Aylesbury, Bucks
K. J. Carpenter, School of Agriculture, Cambridge
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L. G. Chubb, Poultry Res. Div. An. Health Trust, Houghton Grange, Houghton, Huntingdonshire
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A. N. Clegg, 12 Kingshill Ave., St. Albans, Hertfordshire
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A. Cockerill, Mangholes Farm, Acre, Haslingden, Rosendale, Lancs.
R. Coles, Ministry of Agr., Great Westminster House, Horseferry Road, London S.W.1
J. Cook, Nat'l Inst. of Poultry Husb., Newport Shropshire
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Miss D. M. Cooper, Animal Health Trust, Poultry Research Station, Houghton, Huntingdonshire
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R. F. Gordon, Poultry Research Station, Houghton Grange, Houghton, Hunts
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C. Grange, West Hill House, Bury St., Edmund's, Suffolk
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Lady Hannan, 46 Ashley Gardens, London, S.W. 1
B. S. Hanson, Veterinary Laboratory, New Haw, Weybridge
G. Harling, Sandside Poultry Farm, Milnthorpe, Westmorland
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D. L. Hughes, Dept. of Vet. Path., Univ. of Liverpool, 42-44 Bedford St., North, Liverpool 7
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T. E. Knowles, Ministry of Agriculture, Govt. Buildings, Cop Lane, Penwortham, nr. Preston
S. K. Kon, Inst. for Research In Dairying, Shinfield, near Reading
Miss M. E. Lambert, 9 Spring Terrace, North Shields, Northumberland
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A. C. Moore, "Dornie", 4 Avebury Ave., Leicester
W. Moore, National Inst. of Poultry Husbandry, Newport, Shropshire
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T. R. Morris, The University, Reading, Berkshire
J. A. B. Morrison, Min. of Agr., Block 2, Govt. Bldgs., Whiteknights Road, Earley, Reading, Berkshire
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A. J. Rainford, The Land Settlement Assn., Ltd., 43 Cromwell Road, London S.W. 7
G. E. Reddaway, Nat. Agr. Adv. Service, 21 Byron Square, Trumpington, Cambridge
Reeden Poultry Co., Ltd., Dalton, Thirsk, Yorks
I. W. Rhys, Ministry of Agriculture, Block 7, Govt. Bldgs., St. Georges Rd., Harrogate, Yorks
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B. Stansfield, Square Works, Mytholmroyd, Halifax, Yorkshire
I.R.I. Stevenson, Stinglison, Cross-in-Hand, nr. Heathfield, Sussex
Mrs. O. R. Stevenson, Ministry of Agr., 208 High St., Lewes, Sussex
O. R. Stevenson, Ministry of Agr., 208 High St., Lewes, Sussex

C. C. Steward, "Strathdene", Willaston, Wirral, Cheshire
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J. G. Turner, "Springfield", Langley, Maidstone, Kent
L. C. Turnhill, Little Gore, Goudhurst, Kent
F. Tyrrell, 10 Kylemore Ave., Bolton, Lancashire
S. B. Vincent, Kramplingham Hall, nr. Wymondham, Norfolk
A. G. Voss, Riverside Farm, Needham Market, Ipswich, Suffolk (Life Member)
W. A. Crawford & Son, Dormers, Latham Toney, Thetford, Norfolk
D. E. Wakeling, Harper Adams Agr. Coll., Newport, Shropshire
F. R. Walbutton, 15. Queenswood Road, Durleigh, Bridgewater, Somerset
C. S. Walden, "Holden" Chipperfield Road, King's Langley, Herts
J. D. Walden, "Heronsmoor", Chipperfield Rd., Kings Langley, Hertfordshire
Miss M. A. Walker, Norfolk School of Agriculture, Easton, Norwich
A. L. Walther, c/o Crosfields & Calthrop Ltd., Vauxhill Rd., Liverpool 5
A. G. Warren, Min. of Agric., Government Bldgs., Alphington Rd., Alphington, Exeter
P. Warren, c/o Warren & Wood Ltd., Kingstown Trading Estate, Carlisle, Cumberland
Y. Watanabe, Suma Poultry Farm, Hatchford, Cobham, Surrey
E. Waterworth, Netherheyes Farm, Colne, Lancashire
W. J. Welford, Ashley House, Clifton, Oxford
R. Welsh c/o Silcock & Sons Ltd., Stanley Hall, Edmund St., Liverpool 3
W. F. Werrett, Hanns Hall Farm, Willaston, Wirral, Cheshire
L. G. Western, Western Incubators Ltd., E. Hanningfield, Chelmsford
Miss M. E. Whipp, Riseholme Farm Inst., Nr. Lincoln
A. Whitton, Aiskew Poultry Farm, Bedale, Yorks
A. Wilkinson, Plough Farm, Wildhern, Nr. Andover, Hampshire
J. F. Willerton, 59 Welwyn Park Road, Hull, Yorkshire
C. Y. Williams, The Branchet, Kelsall
Mrs. H. Williams, Bodilly Poultry Farm, Helston, Cornwall
J. G. Williams, Bodily Poultry Farm, Helston, Cornwall

V. J. Williams, Nat'l. Agr. Advis. Service, Herts A. E. Committee, Brickendonbury, Herts
E. Williamson, Randlawfoot Farm, Wetheral, Carlisle, Cumberland
K. Wilson, 166 Nevendon Road, Wickford, Essex
H. Wood, c/o Warren & Wood Ltd., Kingstown Trading Estate, Carlisle, Cumberland
P. Woods, 32 Widney Manor Road, Solihull, Warwickshire
A. N. Worden, Nutritional Research Unit, Huntingdon
Miss M. M. Wright, Moorlands, Nenthead, Alston, Cumberland

FINLAND

Niilo Nasanen, Turun Muna Oy, Turku
Paul Olsen, Taklax, Korsnas
Voitto Raulo, Juupajoki, Turku
Armas Rissanen, Haatala, Kuopio
Erkki Tiitola, Kaivanto
Ensio Toivanen, Siipikarjanhoitokoulu, Hameenlinna
H. Westermarck, Lauttasaarentie 16, Lauttasaari, Helsenkik
N. Westermarck, Munkkiniemenpuistotiel, Munkkiniemi

FRANCE

Miss Jeanne Bernard, l'Ecole Menagere Agricole du Jardin d'Essai a Alger, Algerie
Mlle. Bonnet, Ecole Nationale d'Enseignement, Menager Agricole de Coetlogon Rennes I. & V.)
J. Peruchon de Brochard, 52 Rue Longue-des-Capucins Marsaille (B.-du.-Rh.)
Centre Avicole de I'Ile de France, 48 Rue du Ranelagh, Paris 16
L. Cochez, Docteur Veternaire, Eysines (Gironde)
Y. Derrien, Elevage de Fervaal, Cheragas (Alger) Algerie
S. A. Duquesne, a Montford s'Risle, (Eure)
Etabliss, Provimi, 55 Rue Favreuil, Croix (Nord)
Mrs. Ed. Flamencourt, Exploitation avicole du PetitAunay a Meung, S. et L. (Loiret)
Emilo Huault, Elexage du Vexin, Villers en Vexin (Eure)
H. Jacotot, Institut Pasteur, 25 rue du Dr. Roux, Paris XVene
G. Lissot, Laboratories Avicoles, 107 Rue Isambard, Pacy-sur-Eure, (Eure)
L. Passebon, "les Mazeraies" Savonnieres (Indre & Loire)
R. Pero, Director, Station de Recherches Avicoles, Domaine de Vilvert-Jouy-en-Josas (Seine et Oise)
SARB, 16, Chemin de Choulans, Lyon (Rhone)
Societe Technique, D'Alimentation Rationnelle, Chateau-la-Valliere, (Indre et Loire)
J. Thiery, 4 Bis. Rue Michel Chasles, Paris 12th.
M. Tobler, à Dancourt par Nogent le Roi, (E. & L.)
J. Vachette, Service d'Elevage Yaounde, Cameroun
M. Alex Wiltzer, 28 Rue Bonaparte, Paris 6

GERMANY

F. Alberti, Mars-la-Touru-Str. 2, Oldensburg i.O.
O. E. Ansorge, Dürrbeund str. 39, Münster (Westfalen)
L. R. Becker, Engelstr, 50, Münster, Westf.
J. Beyer, BELF, Bonn-Duisdorf
Frl. Bormann, Rusternalle 30, Berlin-Charlottenburg
W. Bremer, Knollerstr 3/II, München
V. Burgsdorff, Garath b. Benrath/Rh.
Chinosolfabrik Aktiengesellschaft, Billbrookdeich 42, Hamburg 48
P. Collignon, Nettekoven, bei Bonn
K. Ehlers, Volsemenhusen bei Marne i. Dithmarschen
H. von Faber, Institut Zoologie, Stuttgart-Hohenheim
R. Fangauf, Steenbeker, Weg 151, Kiel-Wik
K. Fritzsche, Blucherstr. 34, Koblenz
O. Garlichs Koblenzer, Strasse 174, Bonn
Geflügel-Börse, Westdeutsche Ausgabe, S. Jurgens-Verbag, Hohenzollernstr 158, München 13
R. Gleichauf, Dörnbergstr. 25/27, Celle

B. Gorissen, Weselerstr. 566, Münster (Westfalen)
F. Gramatzki, Warburgstr. 35, Hamburg 36
E. Greuel, Inst. f. Anatomie u. Phys. d. Haustiere, Nussallee 5, Bonn
Frau I. Gylstorft, Veterinärstr. 13, München 22
B. Haneberg, Kaiser-Ludwig-Platz. 5, München 15
H. Haas, Landwehr Uber Overath
Prof. Havermann, Endenicher Allee 13, Bonn
Else Hecker, Burgstrasse 1, Sigmaringen
G. Heermann, Ausserhalb 5, Muhlacker/Wurttemberg
Dr. Hohls, Dornbergstr. 25/27, Celle
C. Höveler, Immigrath., Rhld.
Inst. für Tierz. u. Milchwirt., Universität Göttingen, Nikolausberger Weg 13, Göttingen
Dr. Kautz, Geflügelhof "Alt-Wurttemberg", Ludwigsburg, Am Kukelberg
Dipl.-Landw. Klein, Koblenzerstr, 174, Bonn
E. Lauprecht, Mecklenhorst Krs., Neustadt a. Rübenberge
H. Lauter, Franzstr. 19, Eilendorf b. Aachen
E. Mangold, Laubacher Str. 21, Berlin-Friedenan
Dr. Mantel, Erding/Oberbayern, Schliessfach 30
E. Matschke, St. Huberterstr. 38, Kempen (Ndrh.)
Prof. Dr. Mehner, Dörnbergerstr. 25-27, Celle (Hann.)
Miss Elisabeth Mielck, Hohenkamp 6, Geesthacht bei Hamburg
F. Möhlenpage, Lemforde
H. Mohrmann, Sulfeld ub. Gifhorn, Hannover
Fraülein Lotte Mühlich, Marienstr. 25, Stuttgart—S.
H. Müller, Schlobachshot, Böhlitz-Ehrenberg b. Leipzig.
L. Paret, Windfendstr. 6, Tubingen-Derendingen
F. Pfenningstorff, Herwathstrasse 3, Berlin-Lichterfelde
W. Rauch, Anstalt für Kleintierzucht, Dörnberg Str. 25-27, Celle.
F. Regenstein, Winkeln 31, Mün.-Gladbach
Annelise Renneberg, Endenicher Allee 60, Bonn
M. Reschke, Peiner Geflügelhof, Peine
Dr. Reinecker, Bundesministerium für Ernährung, Landwirtschaft und Forsten, Bonn
H. Rüter, Weberstr. 23, Bonn
W. Salzwedel, Obere Vorstadstr. 10, Walldurn, Nordbaden
O. Schiel, Mars-La-Tourstr. 2, Oldenburg i.o.
Landw. Rat Schlütter, Ross Strasse 135, Düsseldorf
E. Schurmann, Katzenburgweg 7-9, Bonn
G. Schwenkenbecher, Saarlandstr. 28, Hamm, Westf.
Prof. Sommer, Landesanstalt für Tierzucht, Grub b. München
H. Spiecker, Riedlingen, Donau
F. Steinhoff, Nutzgeflügelhof, Buchholzer Kirchweg 70, Hannover-Buchhols
Dr. Stute, Dörnbergstr. 25/27, Celle
H. Vogt, Steenbecker Weg 151, Kiel-Wik
K. Wagener, Misburger Damm 16, Hannover
Dr. Rosemarie Wegner, Bismarckstr. 14, Bonn
Dr. Wiedensahl, Weizenmühlenstr. 12, Düsseldorf-Hafen
W. Ziebertz, Kaiser-Friedrichstrasse 249, Duisburg-Hamborn
W. Zorn, Landesforschungsantalt für Tierzucht, Grub bei München, (Amerik Zone)

GOLD COAST

V. F. K. Ayivor, c/o The Cooperative Society, Denu
J. M. B. Essaw, Box 268, Sekoudi

GREECE

J. Dimakopoulos, Agr. College of Athens, Dept. Animal Husbandry, Karneadou St., 36, Athens
G. Georgandas, Georganda Farm, 6 Athinon Road, Kifissia
P. Stavropoulos, 36a Hermou Street, Athens
A. M. Syrigos, 8 Guilford St., Athens

HAWAII

M. M. Rosenberg, Agric. Expr. Station, University of Hawaii. Honolulu

INDIA

D. S. Dhalla, 11 Koregaon Park, Poona 1, (Life Member)
Sri S. Gupta, Poultry Sup., Haringhata Govt. Farm, P.O. Mohonpur, Dr. Nadia, West Bengal
S. G. Iyer, Office in charge, Poultry Research Section, I.V.R.I., Izatnagar, V.P.
C. M. Jasawalla, Fair Fields Farm 14, Salisbury Park, Poona (Life Member)
Mrs. M. N. Roy, Roy's Pedigree Poultry Farm, P.O. Natra. 24 Parganas, West Bengal
T. N. Supe, Government Poultry Farm, Telenkhery, Nagpur 1

IRAQ

K. W. Fangauf, Ministry of Agriculture, Baghdad

ISRAEL

E. Aminadov, Dept., of Poultry Husbandry, Hebrew University, Rehovot
A. Ashel, Poultry Farmers' Ass'n. of Israel, Tel-Yosef.
Z. Ben-Adam, Govt. Poultry Exp. Station, Ako
J. Berkman, Schunat Rasso, Ramat-Hasharon
S. Bornstein, 8 Hapardes St., Tel-Aviv, Israel
R. Goldstein, P.O. Box 3, Binyamina
A. Komorov, 20, Hamargoa St., Haifa
A. Livshutz, P.O. Box 10, Tel-Aviv
P. Melech, Dept. of Animal Husbandry, Hebrew University, Rehovot
E. Moses, Ramot Hashavim, Post Ramataim
J. M. Naftalin, Rothschild Hospital, Mount Carmel, Haifa
J. H. Scheftelowitz, P.O. Box 46, Tel-Aviv
Y. Shek, Poultry Breeders' Union, P.O. Box 1906, Tel-Aviv
M. Taran, Ramat Remez 89/A, Haifa
A. Thomin, POB 7, Kfar, Shmaryahn
David Uri, Min. of Agr., P.O. Box 11, Hakirja
E. Yizchaki, Bet Itzhag, Near Nathanya

ITALY

C. Ansaldi, Via Leopardi 25, Milano
A. Bonomi, Istituto di Zootecnia, Borgo Carissimi 10, Parma
P. G. Buiatti, Via Lambertesca 16, Firenze
Frederico Clementi, Via Flaminia 118, Rome
R. Colombo, Corso Matteotti 4, Castellanza (Varese)
A. Cuendet, Via Piave 11, Arcistate (Varese)
U. D'Alfonso, Villa Rossi, Frazione Ponto, Bisuschio, Varese
Count A. A. D'Altoe, Corso Vittorio Emanuele 11, Piacenza
H. Engler, F.O.A. Agriculture Division, Viale delle Terme di Caracalla, Rome
C. Faravelli, Azienda Agricola di Soriasco, S. Maria Della Versa, Prov. Pavia, Italy
G. M. Franceschetti, Instituto Zootecnico e Caseario per il Piemonte, Via di Pianezza 115, Torino
Ferdinando Garagnani, Assoc. Avicunicola Nazion, Via Begatto 1, Bologna
Allesandro Ghigi, Centro Avicolo di Bologna, Via San Giacomo 9, Bologna (Honorary Life Member)
Ida Giavarini, Instituto di Zooculture, University, Bologna
G. Giordani, Centro Avicolo di Bologna, Via San Giacomo, Bologna
R. Giuliani, Istituo Zootecnico dell Univ., Via Cascine 5, Firenze
C. H. Jones, Poultry Farm St. George, Merano (Bolzano)
D. Marchiori, Lendinara (Rovigo)
Raffele Mazzoni, Via Scire 37, Rome
Maria Marmori, Via Marcona 21, Milano
Gaetano Mucci, c/o Carlo Erba S.P.A., Via C., Imbonati 24, Milan
P. Prandoni, Via S. Carlol, Castellanza (Varese)

Raffaelo Quilici, Stazioni Sperimentale di Pollicultura, Rovigo
Marchesa L. C. S. Salviati, Castellina Marittima (Pisa)
R. Scossiroli, Istituto di Genetica, Universita, Pavia
V. de Simone, Ministro Agricultura e Foreste, Rome
Alulah Taibel, Staz., Sperimentale di Pollicultura, Rovigo
Nicola Tortorelli, Ovile Nazionae, Foggia
F. Ventola, Via Gallarate 107, Milan
Don Celestino Vervoerd, Certosa di Calci, Pisa
Carlo Zarotti, Via Calimala 2, Firenze

JAPAN

Shyoyo Adachi, No. 58, Daikocho 8-chome, Higashi-ku, Nagoya-shi
Shujiro, Ariyoshi, Nat. Inst. Agr. Sci., Chiba-shi
Kokichi Deguchi, Okasaki Livestock Breeding Station, Iga-cho, Okazaki City, Aichi Pref.
Shizuhiko Goto, 7-Chome, Nishino-machi, Gifu City
Dyuro Hasimoto, 12th Kan, Kassui Gakuin Higashi, Yamate-cho, Nagasaki-shi
Tadashi Hatano, Fac. of Agriculture, Tohoku University, Sendai
Bumpei Hayashi, 511 East 8 Ken Kotoni, Sapporo
Kaneo Hibino, 623 Marunouchi Bldg., Toyko
Masayoshi Hirose, Omiya Livestock Breeding Sta., Min. of Agr. & Forestry, Shimoka, Omiya-City, Saitamo
Tatsuo Hosoda, Nat. Inst. Agr. Sci., Chiba-shi, Japan
Sayoku Iida, c/o Kyodo Shiryo Co., No. 1 Chiwaka-cho 3-chome., Kanagawa-Ku, Yokohama
Shunichiro Ito, c/o Hyogo Livestock Farm, Issuimachi, Tatsuno-shi, Hyogo Pref.
Ryuichiro Iwaya, 62 Tomizawa-cho, Sendai-shi, Miyagi-ken
Masao Kamio, 22-1 Shimmei, Kushibiki-cho, Omiya-shi
Takatada Kawahara, National Institute of Genetics 1, 111 Yata Misima
Tohru Komai, Lab. Zootech. Sci. Dept. Agr., Kyoto University
Jirohiko Kondo, 75 Gochome, Asagaya, Suginami-ku, Tokyo (Life Member)
Kampachiro Kudo, No. 18, Iga-cho, Okazaki-City, Aichi-Prefecture
Kiyoshi Masui, Meguroku Komabamachi 764, Tokyo
Hajime Mimura, Faculty f Agriculture, Shinshu University, Ina-shi, Nagano-Ken
Takanaru Mitsui. 35, Suido-cho Bunkyo-ku, Tokyo
Chikao Momose, No. 211, 3-chome, Horinouchi, Omiya-shi, Saitama-ken
Hiroshi Morimoto, Nat. Inst. of Agric. Sci., Chiba-shi
Takayuki Muraoka, c/o Hyogo Livestock Farm, Issaimachi, Tatsunio-shi Hyogo-Ken
Motoo Naito, Lab. Animal Breeding, Bunkyo-ku, Tokyo University
Seiichi Nakajo, No. 86, Tyasengi, Anzyo-City, Aiti-Ken
Shusako Nishida, Fac. of Agric., Tohoku University, Sendai
Tetsusaburo Nishikawa, Higashiterao 640, Tsurumi-ku, Yokohama
Takashi Ohara, Ohnomachi, Saeki-gun, Hiroshima Pref.
Isamu Ohno, c/o Hamaraka-So 2, 5-2 Nakayama-cho, Mizuho-Ku.
Shigeki Okazaki, Higashishiraishi, Yamaguchi-shi, Yamaguchi-ken
Nobuhiko Onishi, Livestock Section, Inst. of Agr. Sciences, Chiba City
Yuichi Saeki, Nat. Inst. of Agr. Sciences (Nogyo Gijutsu Kenkyojo) Chiba-shi
Michio Saito, c/o Nagoya Univer. Fac. of Agr., Anjo City, Aichi, Prefecture
Kiyotsuna Sasaki, No. 323, Eifuko-cho, Suginami-Ku, Tokyo
Reiji Seki, c/o Ohmiya Livestock Farm, Shimoka, Omiya-shi
Tadakishi Shimamura, 5 Kamifujimae-machi, Bunkyoku, Tokyo
Fumio Sugimoto, c/o Kumamoto Livestock Farm, Nishigoshi-mura, Kikuchi-gun, Kumamoto-Ken
Yoshimasa Takakubo, No. 2954, 2-chrome, Higashi-nakacho, Omiya-shi, Siatama-ken
Tomeo Takamatsu, 1-2 Minami-Kajiya-machi, Naka-ku, Nagoya

Morio Takano, Nishigoshi-mura, Kikuchi-gun, Kumamoto-ken
Masaharu Tange, 564 Terukuni-machi, Fukuoka
Masaharu Tauchi, Hyogo Syuchiku Bokujo, Itusaicho, Tatsunoshi, Hyogoken
Shoji Uesaka, Agricul, Dept., Kyoto University, Kyoto
Ikuo Ushigoshi, Tudanuma 1359, Narashino, Chiba Prefecture
Takuru Yamaguchi, c/o Nihou Nosan Kogyo Co., Lt., 2- Nichome, Shinurashima-cho, Kanagawa-ku Yokohoma
Tokuzo Yamaguchi, 125 Wakabayashi-cho, Setagaya-ku, Tokyo
Kiyoshi Yamanaka, 623 Marunouchi Bldg, Tokyo
Yoshichiro Yoneno, Kamikanuki, Numazu-shi, Shiquoka-ken
Yoshimaro Yamashina, 49 Nampeidai, Shibuyaku, Toyko
Chikao Yoshimura, c/o The Kyodo-Shiryo Co., Ltd., No. 1, 3-chome, Chiwakacho, Kanagawaku, Yohohama
Shozo Yoshioka, c/o Livestock Production Sec., Livestock Bur. Min. Agr. & Forestry, Tokyo

KAMBODIA

T. Werner, c/o F.A.O. Mission, P.O. Box 435, Phnom-Penh

KOREA

Bong Kug Ohh, Dept. of Animal Husbandry, College of Agr. Seoul National University. Suwon

LEBANON

O. Juzzar, P.O. Box 3196, Beirut
P. Nasrallah, Imperial Chemical Ind., Ltd., Box 95, Beyrouth

LIBYA

B. A. Ivory, Poultry Husbandry Advisor, USOM/American Embassy, Tripoli
A. Feller, 40 Avenue De La Porte Neuve, Luxembourg

MALTA

A. Azzopardi, 191 Ridolfo St., Sliema
Joseph Cesareo, 184 Pieta Wharf, Pieta

MEXICO

Mario Amaya E., Matamoros Ote 1034, Monterrey, N.L.
R. J. Bean, Granja Claravista, Pabellon Ags.
D. Guardiola Castro, Apartado Postal 31370, Villa Alvara Obregon
G. Focke, Apartado Postal 31931, Coyoacan, D.F.
G. Hamer, M. Villalongin #128-10, Mexico 5, D.F.
O. T. Ocana, Pestalozzi 905, Mexico 12 D.F.
R. P. Walz, Avicola del Pacifico, Guaymaz, Sonora

NETHERLANDS

H. Adams, Brouwersmolenweg 402, Ugchelen
M. van Albada, 5 Spelderholt, Beekbergen
A. J. van Amerongen, C. 189, Epe
B. van Asperen Vervenne, Hoofstraat 29, De Steeg
G. J. W. Beestman, 109 Vriezeveenseweg, Almelo
G. W. J. van Bers, c/o N. V. Philips-Roxane, 171-177 P. C. Hoofstraat, Amsterdam
L. de Blieck, Soestdijkerstraatweg 113, N. Bilthoven
W. M. Blok, 16 Baron van Nagellstraat, Voorthuizen
J. M. van der Born, Veeartsenijkundige Dienst, 99 Prins Mauritslaan, The Hague
K. Bos, Jacob Catslaan 39, Amersfoort
O. Bosgra, c/o N. V. Philips-Roxane, Postbus 2, Weesp.
P. J. van de Bremer, 22 Doornakkerlaan, Boxtel
E. ten Cate, Wierdensestraat 51, Almelo
A. Clarenburg, Sterrenbos 1, Hoofd v.d. Veterinarie Afd. van het Rijksinstituut v.d. Volksgezondheid, Utrecht
J. van der Deure, Stationsweg 52, Ede
P. G. A. v d. Eijnden, 8 a 't Zand, Boxmeer
J. H. Faber, Zwaademaker's Handel en Industrie, n.v., Postbus 3, Zaandam
H.M.K. Frings, Dorpstraat 105, Beekbergen
E. F. Geesink, 15 Wilhelminapark, Utrecht
J. Grashuis, "De Schothorst," Hoogland

W. Groenevelt, 86 Prinses Julianalaan, Rotterdam
E. H. Groot, Chemische Fabriek "Noord Holland," Beverwijk
U. Haye, van Hasseltlaan 65, Apeldoorn
J. F. Helder, Spelderholt 3, Beekbergen
J. J. M. Hendrickx, 7 Stationsplein, Boxtel
E. J. H. M. Hendrix, Abdijhof, Roermond
D. C. Heyboer, 20 Veldesebosweg, Warnsveld
W. K. Hirschfield, Middelweg 85, Leersum
L. Hoedemaker, De Savornin Lohmanlaan 493, 's-Gravenhage
J. Hoekstra, Pauw van Wieldrechtlaan 5, Zeist
B. Hooghiemstra, 144 Keulsekade, Utrecht
W. ten Hoopen, Zutfenseweg 108, Lochem
A. W. Huidekoper, Bothaplein 1, Arnhem
W. Huisman, Aronskelkweg 48, 's-Gravenhage
A. Jansen, 152 Harderwijkerweg, Ermelo
J. Jansen, Institute for Infectious Diseases, Biltsraat 168, Utrecht
R. S. Kaltofen, 30 Waltersingel, Apeldoorn
G. Kingma, c/o U. Twijnstra's Oliefabrieken n.v., Maarssen
H. G. Kok, Taalstraat 20, Vught
J. G. Konings, Oirschotlaan 25, Zeist
J. Kortenoever, Koningslaan 64, Utrecht
H. Koudijs, "De Cotelaar," Barneveld
W. Koudijs, Kooterweg 70, Barneveld
F. C. Kraneveld, Inst. v. Tropische en Protozoaire Ziekton, Biltstraat 172, Utrecht
F. A. de Lange, Harderwijkerweg 142, Ermelo
J. C. Leinweber, P. Breughelstrat 300, s'Hertogenbosch
M. Leverland, Arnhemseweg 598, Beekbergen
C. L. van Limborgh, c/o N. V. Handel Maj. Trouw en Co., 1 Spinozastraat, Amsterdam (C)
H. L. L. Maas, 35 Regentesselaan, Amersfoorst
J. C. A. van der Maas, 41 Bergerweg, Alkmaar
O. Meijer, c/o Messers W. Bakker, A-weg 5, Groningen
J. L. Mensonides, 82, Omval, Alkmaar
J. W. Meynen, 16 Diepenbrockpark, Weesp
P. G Methorst, Arnhemseweg 453, Beekbergen
J. S. Mulschelegel, Schoollaan 23, Beetsterzwaag
E. E. Muytjens, Lab. N.V. Chem. Fabriek "Noord-Holland," Beverwijk
A. A. Oskam, 124 Kerkweg, Lekkerkerk
G. J. van der Poel, 39 Fabriekstraat, Boxmeer
S. J. Postma, Bildsestraat 36B, Leeuwarden
R. Prakken, Bosweg 43, Wageningen
D. Rempt, Landbouwhuis, Directeur Gezondheidsdienst voor Dieren in Noordl-Holland, Alkmaar
J. Richter, Bakelkeerstraat 2, Boxmeer
D. C. de Ridder, Raamweg 25/27, 's-Gravenhage
H. A. van Riessen, Dierenarts, Ederveen
F. H. Robers, Oostelijke Pluimvee Cooperatie, Enschede
W. J. Roepke, Amersfoortsestraat 47, Soesterberg
C. Romijn, Waterweg 32A, DeBilt
K. A. A. Rouwenhorst, Prins Alexanderweg 58, Huis ter Heide
J. J. Ruys, Berg en Dalweg 1, Beekbergen
W. H. Schimmel Amersfoortsestraat 35, Barneveld
L. P. Schmidt, Pelikaanweg 19, Soest
H. H. Scholten, 65 Anna van Burenlaan, Haarlem
H Sluis Sluis' Fabrieken, N. V. Weersperkarspel
W. H. Smits, Plasweg 42, Soest
G. C. Stheenis, 202 Molenstraat, Monster
C. Suurenbroeck, c/o N. V. Handel Maj. Trouw en Co., 1 Spinozastraat, Amsterdam (C)
J. W. Tingen, Sectaris Raad van Deheer en Toezicht, 160 Herengracht, Amsterdam
J. G. Tukker, Utrechtseweg 298, De Bilt
P. Ubbels, Spelderholt 9, Beekbergen

C. S. Th. Van Gink, Joh. Vermeerstraat 3, Heemstede
J. Veenhof, "Marienwaerd," M 9 Beesd.
G. S. E. Vegter, Dierenarts, Holten
M. J. Verkuil, 20 Maarsebergsweg, Woudenberg
H. J. Verkuyl, 6 Nassaulaan, Bergen (N.H.)
N. J. de Vin, R. 170, Slagharen
A. H. J. Visschedijk, Koningin Julianastraat 22, Bunnik
M. Visser, 75, Stationsweg, Woudenberg
H. J. van de Vliert, 1 van Nijenhovelaan, Hoogeveen
N. den Voogd, Archipellaan 19, Delft
E. J. Voute, 31 Laan 1914, Amersfoort
G. de Vries, Jac. v/d Borchstraat 48, Utrecht
G. M. van Waveren, Poelslaan 35, Rollerdam
Vroeg in de Wey, 1 Bothaplein, Arnhem
S. v. d. Wielen, c/o Olifabrieken Calve Delft, Delft
P. J. Wijk Pzn, Haersma de Withlaan 9, Apeldoorn
D. J. Wiltink, Willenstraat 11, Doetinchem
B. H. v.d. Zanden, van Ruysdaellen 11, Liedchendam
F. A. de Zeeuw, Soestdijkersweg 91, DeBilt
D. M. Zuydam, 38 Charlotte de Bourbonlaan, Rotterdam
N. Zwiep, N.V. Philips-Roxanne, Weesp

NEW ZEALAND

C. J. Aitken, Broodfield, No. 4 Rural Delivery, Christchurch
F. J. Batkin, Poultry Demonstration Plant, Upper Hutt Per P. B., Wellington
H. G. Birnie, Poultry Demonstration Plant, Upper Hutt, Per P.B., Wellington
A. C. Bridle, Gen. Mgr., New Zealand Poultry Board, 189 Featherston St., Wellington C1
A. H. Button, P.O. 25, Lincoln
E. Chambers, Wattledene, 122 Carmen Rd., Hornby, Christchurch
B. H. Chaadderton, "Edorvale", Puhinui Road, Papatoetoe, Auckland
D. K. Chamberlain, Box 32, Waverly
A. Davies, Box 2, Kumeu, Auckland
W. Dixon, An. Nutr. Div., D. H. Brown & Son, 38 Moorehouse Ave., Christchurch, C.1
A. P. Dolamore, 91 Forfar St., Mosgiel, Otago
T. S. Dove, 19 Rima St., Riccarton, Christchurch
J. Emondson, Dept. of Agr., Poultry Demonstration Plant, Gibbons Road
G. J. ten Hove, "Salland", Kennedy's Bush Rd., Christchurch S.W.2
J. H. Jones, Dept. of Agriculture, Oamaru
J. H. Kissling, c/o The Library, Massey Agr. College, Palmerston North
W. D. Reed, Lakeside Poultry Farm, 17 Lake Terrace Road, Christchurch N.E. 2
A. E. Salisbury, Salisbury's Limited, P.O. Box 23, Upper Hutt
Mrs. N. W. A. Smith, Linton Farm, R.D. 7, Te Awamutu
N. Smith, Wallaceville Animal Res. Sta., Wellington
Miss M. W. Stewart, P.O. Box 109, Tauranga
Supt. of Poultry Industry, Dept. of Agric., Wellington
M. Sutton, Department of Agriculture, Dunedin
W. J. Waites, 63 Factory Road, Belfast, Canterbury

NIGERIA

D. H. Hill, Faculty of Agriculture, University College, Ibadan

NORTHERN IRELAND

John Algie, Ministry of Agriculture, Stormont, Belfast
Fred R. Best, Lurgan Boxmaking Co., Ltd., Boxmore Lodge, Lurgan
A. N. Bingham, Loughry Agr. College, Cookstown, Co. Tyrone
Miss A. E. Boyd, Ministry of Agriculture, Stormont, Belfast
R. G. Calvert, The Poultry Farm, Ballywalter
Miss M. H. Davidson, Poultry Advisory Officer, Dublin Road, Omagh, County Tyrone

Miss R. E. Dick, The Square, Antrim
Miss A. G. English, 46B. Killuney Drive, The Folly, Armagh
Mrs. D. C. Gamble, Holmvilla, Castelderg, Co. Tyrone
R. J. Hanna, "The Oaks", Moyheeland, Drapertown, Co. Derry
T. J. Kennedy, Millisle, Co. Down
T. A. Larmour, 7 Edinburgh Villas, Omagh, Tyrone
David Luke, The Farm, Stormont, Belfast
Miss Janet Magowan, Tullyheron, Mountnorrie, Armagh
J. McW. Moore, Heatherville, Gransha, Bangor
J. G. Rhynehart, Lisbaine, Monkstown, Co. Antrim
W. G. Shannon, Loughry Agr. College, Cookstown, Co. Tyrone (Life member)
The Agr. Research Inst., of Northern Ireland (R. W. Hale, Sec.), Hillsborough, Co. Down
R. F. Thompson, 76 Victoria Gardens, Belfast
Miss R. G. Walker, The Brook, Enniskillen, Co. Fermanagh
J. A. Young, Loughry Agr. College, Cookstown, Co. Tyrone (Life Member)

NORTHERN NIGERIA

J. A. Roberts, Poultry Investigation Lab., Veterinary Dept., Kaduna

NORWAY

T. Anda, Sandnes
G. Bruasdal, Magnus Barfotsgate 27, Bergen
G. J. Christensen, Hansteensgt 12, Oslo
Leif Elstad, Seterstoa
A. Eskilt, Sem. Hvalsted
Kr. Grepstad, Skien
Paul Grude, Kleppe
Johan Haheim, Box 806, Oslo
Rhode Hansen, N.E. S/1 Chr. Krogh's St. 30, Oslo
Johs Hoie, Norwegian H.S. for Agriculture, Vollebekk
John Holland, Slagen, Tonsberg
Emil Jessen, Hvalstad
Jonas Jonassen, Mossige, Bryne
Arnbjorn Laerdal, Avaldsnesgt 100, Stavanger
B. Laksesvela, Straumveien 221, Straumsgrend
Bjarne Moy, Spedalen
Hakon Nilsen, Skogerst
Odmund Riis-Strom, Nodrehov
A. E. Svendsen, Kleiva i Vesteralen
Leif Svendsen, Norsk Fjorfeavlslag, Tollugaten 12, Oslo
J. P. Tandberg, Ski
Sverre Thingulstad, As

PAKISTAN

M. H. Ghias, 786, Pir Ellahi Buksh Colony, Karachi 5
S. A. Hag, Officer on Special Duty, Min. Comm., Govt., Pakistan, Karachi
A. Husain, 41 Sugan Mansion, Opposite Idgash, Bunder Road, Karachi
S. H. M. Hussain, 64/5 Aghakham St., Lawrence Rd., Karachi
N. Islam, 49 Intelligence School, Queens Road, Karachi
M. Q. Khan, 20, P.I.B. Colony, Karachi 5, Pakinstan
E. Manekjee, 20 Parsi Colony, Karachi (Life Member)
M. Naswararanjee, 20 Parsi Colony, Karachi (Life Member)

PHILIPPINE ISLANDS

G. O. Ranit, Poultry Dept., College of Agr., College Laguna

POLAND

Laura Kaufman, Krola Leszczyniskiego 9, Lublin

PORTUGAL

A. F. E. Silva, Alameda Afonso Henriques, No. 78-4° Esq., Lisbon

REPUBLICA DOMINICA

K. W. Kwan, El Conde 90, Siudad Truiilo
J. Pulgar, Instituto Politecnico "Loyola," San Cristobal, P.T.

SCOTLAND

Miss E. J. Anderson, Department of Agriculture for Scotland Broomhouse Drive, Saughton, Edinburg 11
Mrs. E. J. Argo, Lynhurst, Harvieston, Stonehaven, Kincardineshire
William Bolton, Poultry Research Centre, King's Building, West Mains Road, Edinburgh 9
Miss D. S. Brocklehurst Coll. of Agr., Cleeve Gardens, Oakbank Road, Perth
Miss M. C. Cameron, c/o The British Oil & Cake Mills, Limited, 88 Regent Quay, Aberdeen
J. H. Carmichael, Thomas Howden, Limited, Craigentinny Avenue North, Leith, Edinburgh 6
Peter Cartwright, 40 St. Magdalene's Road, Craigie, Perth
Mrs. Moira S. Cobb, N. of Scotland Coll. of Agr., Deanery Bldgs. Dornoch, Sutherland
A. C. Coutts, Links Cottage, Banff
Miss E. I. Coutts, Rose Villa. Alford, Aberdeenshire
Mrs. C. H. M. Cowan, The Blair, Fintray, Dyce, Aberdeenshire
Mrs. E. Dalziel, Courthill, Auldgirth, Dumfriesshire
Miss M. H. Deans, Department of Agriculture for Scotland, Greyfrairs House, Gallowgate, Aberdeen
John Duckworth, Rowett Research Institute, Bucksburn, Aberdeenshire
Miss E. M. W. Duff, Department of Agriculture for Scotland, Broomhouse Drive, Saughton, Edinburgh 11
Miss C. M. Dunn, Agricultural College Office, 41½ Union Street, Aberdeen
Albert Edmondson, The British Oil & Cake Mills, Limited, 19 Blythswood Square, Glasgow, C 2
A. Finlayson, "Fairview," Beaconsfield Terrace, Turriff, Aberdeenshire
John Getty, Dept. of Agr. for Scotland, Livestock Improvement Branch, Broom House Drive, Saughton, Edinburgh 11
W. J. Gill, James Gill & Sons, Ltd., 6 Exchange St., Aberdeen, Scotland
A. W. Greenwood, Poultry Research Centre, King's Buildings, West Mains Road, Edinburgh 9
Stanley Kaye, Headinch Farm, Dinnet, Aberdeenshire
W. R. Ketchin, Harcarse Hill, Duns, Berwickshire
Miss Susan Kirk, 17 Buccleuch St., Dumfries
Miss M. D. Langlands, N. Scotland College of Agr., Drummond Hill, Statherrick Rd., Inverness
L. S. Lyall, West of Scotland Agr. Coll., The Market, Ladyacre Road, Lanark (Life Member)
Miss M. M. Macleod, 99 Trinity Road, Edinburgh
Mrs. A. G. Maxwell, Golfhill, Moffat, Dumfriesshire
J. R. McCallum, Dept. of Agr. for Scotland, St. Andrews House, Edinburgh 1
Mrs. M. A. B. Melville, Balmullo House, Leuchars, Fife
Miss M. S. Miller, Department of Agriculture for Scotland, Grayfriars House, Gallowgate
Miss E. M. Mills, 24/26 Beresford Terrace, Ayr.
T. Milne, Kellas Poultry Farm, Kingennie, by Broughty Ferry
H. Morrison, Crosfields, Turriff, Aberdeenshire
R. G. C. Nisbet, Dept. of Agr. for Scotland, St. Andrews House, Edinburgh 1
Miss D. J. Peace, Poultry Research Centre, King's Buildings, West Mains Road, Edinburgh 9
Miss E. Y. Steven, North of Scotland Col. of Agr., 5 High St., Dingwall, Ross-shire
J. W. Taylor, 6 Samson Ave., Kilmarnock, Ayrshire
W. H. Tytler, Hillcroft Banchory, Kincardineshire
Sir Edward Villiers, Easter Hatchery, Conon Bridge, Ross-shire
R. Chalmers Watson, Fenton Barns, Drem, East Lothian
David M. Weir, 7/9 Arthur Street, Leith, Edinburgh 6
Donald S. Weir, 7/9 Arthur Street, Leith, Edinburgh 6

T. E. Whittle, West of Scotland Agriculture College, Auchincruive, Ayr.
J. D. Wightman, 4 Scotland Street Lane, Edinburgh 3
J. E. Wilson, Ministry of Agriculture Poultry Laboratory, Lasswade, Midlothian
Miss M. B. F. Wilson, British Oil & Cake Mills, Limited, Seafield, Leith.
D. P. Wright, Bass Rock Poultry Farm, North Berwick, East Lothian
J. Young, Boglea, Alyth, Perthshire

SOUTH AFRICA

Norman Aitken, "Norran," Camperdown, Natal
Amsterdam Estates, P.O. Box 78, Broughton, Transvaal
J. A. de Beer, College of Agric., Glen, Orange Free State
M. Bergh, Private Bag 17, Johannesburg
N. Berold, "Vrede en Lust Farm" P.O. Box 4829, Cape Town
S. G. Birch, c/o Box 472, East London, Cape Province
J. J. Blignaut, c/o The High Veld's Reg. Office, P/B Potchefstroom, Transvaal
H. C. Bodemer, P.O. Box 41, Koppies, Orange Free State
R. R. Boyce, P.O. Box 55, Bramley, Johannesburg
P. J. Buchner, Waggie, Sandflats, Cape Province
Mrs. D. M. Charter, Inanda Road, Hillcrest, Natal
G. Clay, P.O. Box 19, Oberholzer, Transvaal
J. D. W. A. Coles, Div. of Vet. Services, Onderstepoort, Pretoria
R. B. Cumming, P.O. Box 1, Sandown, Johannesburg
A. Dale, P.O. Thornhill, Cape Province
H. L. Davies, P.O. Box 42, Magaliesberg, Transvaal
Dixondale Poultry Farm, P.O. Box 8, Gordon's Bay, C.P.
S. Ebedes, Zwartkop Poultry Farm, P.O. Box 529, Pretoria
J. E. Arasmus, Elsenburg-Stellenbosch Coll. of Agr., P.O. Box Muldersvlei, Cape Province
J. L. Esterhuysen, "Sonop" P.O. Box 91, Kuilsriver, Cape Province
A. A. I. Fermont, 2, Simmonds Street Ext., Johannesburg, Transvaal
B. H. Field, Dalroyd Poultry Farm, P.O. Seven Oaks, Natal
L. M. Fine, Goedehoop, P.O. Box 12, Elgin, Cape Province
R. H. Fotheringham, 66 Central Street, Lower Houghton, Johannesburg
Mrs. Kelly Freeborn, P.O. Box 9, Lynnwood via Pretoria
C. H. Friend, Box 23, P.O. Northlands, nr. Johannesburg
L. W. C. Gaymans, 90 Linbro Park, P.O. Edenvale, Transvaal
A. M. M. Gericke, P.O. Box 120, Silverton, Via Pretoria
J. J. Grobler, P.O. Box 205, Standerton, Transvaal
B. P. deGroot, Chickwick Poultry Farm, P.O. Box 12, Koelenhof, Cape Province
G. M. E. Grove, Cranmere, P.O. Box 98, Knysna, Cape Province
C. H. Haagner, P.O. Box 115, Potchefstroom, Transvaal
H. K. Haagner, P.O. Box 607, Bethlehem, Orange Free State
W. J. Ham, Box 170, Boksburg, Transvaal
Mrs. B. van Heerden, P.O. Box 529, Benoni, Transvaal
R. Heimann, Lismore Ave. off Tokai Rd., P.O. Retreat, Cape Province
George Hibbert, Athlone Farm, P.O. Box 41, Berglvei, Transvaal
R. E. Holmes, P.O. Box 4022, Port Elizabeth, Cape Province
C. A. Huntley, "Good Hope", P.O. Umzinto, Natal
A. D. Irvine, 221 Lyttleton Agr. Holdings, P.O. Clubview, nr. Pretoria, Transvaal
D. Jacobs, 38 Epsom Rd., New Red Ruth, via Alberton, Transvaal
Robert S. James, Clearspring Farm, P.O. Klipheuvel, Cape Province
E H. Jaques, Efrata Farm, Private Bag 717, Louis Trichardt, Transvaal
G. A. L. Johnson, Rembrandt Poultry Farm, Constantia, Cape Province

W. W. Johnston, Rockdale, Kei Road, Cape Province
M. H. Jones, Willow Poultry Farm, Kroonstad, Orange Free State
Mrs. G. H. Kuit, P.O. Box 25, Lydenburg, Transvaal
E. Lacon-Allin, P.O. Box 61, Hillcrest, Natal
La Nelle Hoenderboerdery, 39 Goud Street, Johannesburg
Lello and Ingle, P.O. Botha's Hill, Natal
M. S. Letty, South African Poultry Assn., P.O. Box 1795, Johannesburg
R. R. Levey, G.P.O. Grahamstown, Cape Province
C. R. Liebenberg, University of Stellenbosch, Stellenbosch, Cape Province
C. L. Marais, College of Agriculture, Potchefstroom, Transvaal
A. V. McCarthy, Glenaholm Poultry Farm, Town Bush Valley, Pietermaritzburg, Natal
Meerhof Poultry Farm, P.O. Meerhof, near Pretoria
J. A. van der Merwe, P.O. Box 87, Heidelberg, Cape Province
B. W. D. Moodie, P.O. Box 3006, Johannesburg
A. P. Mutch, P.O. Box 566, Benoni, Transvaal
W. A. G. Nel, Blompot, P.O. Box 22, Koelenhof, Cape Province
A. H. G. Olivier, P.O. Box 75, Mooresburg, Cape Province
Mrs. C. J. Otto, "Trinwilliam", P.O. Box 462, Bloemfontein, Orange Free State
Mrs. V. J. Parker, P.O. Gilletts, Natal
P. H. C. duPlessis, c/o The Agr. Res. Institute, The University, Pretoria, Transvaal
D. B. Poulton, P.O. Box 253, King Williams Town, Cape Province
P. V. Poultry Farm, P.O. Houw Hoek, Cape Province
A. G. Randall, "Walsingham," Southwell, via Grahamstown, Cape Province
Rand Epileptic Employment Association, Cr. Richmond & Marlborough Avenues, Craikhall, Johannesburg
A. A. Reed, P.O. Box 1795, Johannesburg
C. Saporetti, P.O. Box 2, Klipheuvel, Cape Province
L. Saunders, "Glen Berwyn," P.O. Twyfelspoort, Transvaal
P. J. Serfontein, 7, Noordbrug Road, Potchefstroom, Transvaal
N. W. Sheppard, The Willows, P.O. Silverton, Nr. Pretoria, Transvaal
Silversands Poultry Farm, Coniston, P.O. Constantia, Cape Province
J. H. Slabber, P.O. Box 40, Moorresburg, Cape Province
N. M. Slater, Fort Wiltshire, P.O. Alice, Cape Province
H. T. Slatter, P.O. Box 1606, Durban, Natal
L. J. Smith, Ou Rosenhof West, Stellenbosch, Cape Province
E. Southworth, P.O. Box 31, Bloemfontein, O.F.S.
H. Stein, P.O. Box 6521, Johannesburg
S. A. R. Stephan, Box 497, Cape Town
W. D. Steyn, P.O. Soutpan, via Bloemfontein, Orange Free State
D. J. Strauss, P.O. Box 5006, Boksburg, North, Transvaal
O. P. Thomas, United Oil and Cake Mills Ltd., Box 24, Merebank, Natal
Mrs. H. H. Thornhill, Sans Souci, P.O. Box 208, Lydenburg, Transvaal
J. N. Van den Bergh, College Rd., Rondebosch, Cape Province
J. L. Van der Walt, P.O.D. Box 139, Graaff-Reinet, Cape Province
J. A. Van Niekerk, P.O. Box 48, Lynnest, Pretoria
W. C. J. Van Rensburg, Private Bag 176, Pretoria
W. C. J. Viljoen, College of Agriculture, Glen, Orange Free State
W. R. Wall, Oakleigh, Private Bag 6020, Pietermaritzburg, Natal
A. M. Ware, Rickivy Poultry Farm, P.O. Box 257, Pietermaritzburg, Natal
K. C. Warrand, The Nest Poultry Farm, P.O. Claridge, Natal
S. J. D. Webb, c/o Ideal Cubes (Pty), Ltd., P.O. Box 205, Roodeport, Transvaal
J. P. H. Wessels, College of Agriculture, Cedara, Natal

H. E. Wicks, P.O. Box 709, Port Shepstone, Natal
A. G. L. Wilson, c/o Laymore (Poultry) Ltd., P.O. Blackheath, Cape Province
T. B. Wright, P.O. Box 20, Highlands, Cape Province
J. Zwarenstein, P.O. Box 405, Pietermaritzburg, Natal

SOUTHERN RHODESIA

Chief Poultry Officer, P.O. Box 8025, Causeway, Salisbury, Via Cape Town
G. M. Gillespie, Twentydales Poultry Farm, P.O. 1828, Salisbury
W. W. McKinney, Gwebi Agr. College, P.O. Box 376, Salisbury
The Principal, Gwebi Agricultural College, P.B. 376B, Salisbury

SPAIN

F. Blanco, Maratines 23, Madrid
F. Castello, Real Escuela de Avicultura, Arenys de Mar
L. Latorre, Facultad de Veterinaria, Cordoba
F. Orozco Pinan, Exploitation Agricola "El Encin", Meco (Madrid)

STRAITS-SETTLEMENT

E. B. Chase-Currier, 355a Joo Chiat Place, Singapore 15
K. T. John, Veterinary Dept., Johore Bahru

SUDAN

J. S. Garside, Univ. Collegetown of Khartoum, Vet. Sci., P.O. Box 32, Kartoum North

SWEDEN

V. Adalberth, Fjäderfåskolan, Hörby
Emil Ander, Harsback
Johan Andersson, Arnas, Askloster
Bachers Honseri, Ala Kraklingbo
J. Bondesson, Tingsryd
K. Borjesson, Seminariet, Rimforsa
Dotetorps Kontrollhonseri, Asa Station
O. Eliasson, Saleby
Firma Ivander, Postl. 172, Frillesas, Kragga Gard. Ekolsund
B. Flygare, Svenska Agghandelsforb, Kungsgatan, 67, Stockholm
E. Flygare, Degeberga
Ivar Fors, Harald Mors & Co., Aktiebolag, Box 471, Stockholm C
G. Goude, Aggcentralen, Vaxio
C. E. Gunnar, Lycketorps Honseri, Mjolby
Einar Haeggblom, Karemo
Stig Holmberg, Grimhallen, Torskinge
J. Holmgren, Alvangens Honsgard, Postfack 130, Alvangen
E. Hultin, AB Evos, Sodertalje
V. Hultkrantz, Backelid, Lindfors
B. Hylmo, Selleberga 6, Bjuv
Axel Isaksson, S. V. A. Stockholm 50
Olaf Jaeger, Nykvarn
Holger Karlsson, Overby Kontrollhonseri, Uddevalla
H. Leijding, Lingbo honseri, Lingbo
W. Linghager, Kvarngärdsgatan 1b, Goteborg
A. Loof, Hakantorp
F. Malmros, Vara Kontrollhonseri, Vara
Nils Olsson, Höör
Petrus Forsbergs honseri, Asgaru
Ragnar Nygards honseri, Postl. 15, Leksboda
Gustav Roos, Grev. Rosengatan 1, Orebro
Sodra Alvsborgs Aggcentral Förening u.p.a. Katrinedalsgatan 14, Boras
Frau Alva Svensson, Tockarp, Glimakra
Sune Traskman, Sveriges fjaderfaavelsforening, Bjorkesta, Nykvarn
C. Wadne, Herrgardsvagen 4, Uppsala 9
A. Wennerberg, c/o A. B. Kontrollfoder, Box 4123, Goteborg 2
Seved Werntoft, Werntofta Fjaderfaavelsstation, Klagstorp

SWITZERLAND

Adolf Achermann, "Flora," Rothenburg/Lu
W. Andres, Geflügelfarm, Nassen (St. Gallen)
Emil Bachofen, Halsen Hinter Egg, Zürich
W. A. Bachofen, Hebelstrasse 92, Basel
H. Baltensperger, Gutsverwaltung, Stockenstraase 88, Kilchberg (Zurich)
Willy Beeri, Parc Avicole, Epalignes s/Lausanne
J. Berkowitsch, General Willestrasse 8, Zurich
E. Billeter, Geflügelfarm Zürcherstrasse 141, Dietikon (Zurich)
E. Birrer, Geflügelfarm, Klingnau
H. Bodmer, Feldmeilen (Zurich)
Ernst Bolliger, Geflügelfarm, Bachli-Hemberg, St. G.
Leo Bolter AG, Geflügelfarm und Futterbabrik, Birkenau, Buchs, St. Gallen
Emil Bosshardt, Geflügelfarm, Wila Zürich
W. Bügler, Geflügelzucht, Neftenbach (Zürich)
H. J. Bussman, Hämmermuhle A. G. Olten
B. Chappot, parc avicole, Sablile, Saxon (Valais)
Frau Drappen Geflügelfarm, Bülach
Hans Dreyer, Werdtweg 5a, Bern
Ernst Duttlinger, Klaisberg, Neftenbach
Harald Ebbel, Ovomaltine Eierfarm, Oberwangen (bei Bern)
Hans Engler, Schweiz. Geflügelzuchtschule, Zollikofen-Bern, (Rome Italy)
G. Flory, 12, Vieux Clos, Conches (Geneve)
Martha Fluckiger, Geflügelfarm, Rothrist
E. Frey, Geflügelfarm, Eschenz, Thurgau
A. L. Geisendorf, c/o F. Hoffman-LaRoche & Cie., Grenzacherstrasse, Basel
Hans Günthard, Grüt, Adliswil, Zurich
Fritz Gutknecht, Gerichtshausstrasse, Pfäffikon, (Zurich)
K. Haag, Rathausstrasse, Weinfelden
E. Haefeli, Geflügelfarm, Dickloo, Oberglatt (Zurich)
Paul Hagemann, St. Jakobsstrasse 191, Basel
E. Hess, Breitengerstrasse 27, Zurich 2
H. Hiltpold, Kanzleistrase 227, Zurich 4
K. Hofer, Geflügelfarm, Egnach (Thurgau)
M. Holliger, Futtermühle, Wiler bei Utzenstorf
K. Huni, Arvenweg 8, Spiegel (Berne)
H. Hürzeler, Kase en gros, Aarau
Institute für Haustierernährung, der ETH, Universitatsstrasse 2, Zurich
M. Juvet, Centrale des fourrages, SEG Berne, Englehandenstrasse, Bern
Joh. Kappeler-Gutknecht, Reservoirstrasse 205, Basel
Erwin Keusen, Geflügelzüchter, Horgenberg, Zurich
A. Kiener, Sulgenrain 10, Bern
E. Klaus, Geflügelfarm, Staufen (Aargau)
Mrs. K. Kunath-Schinkel, Katharinenhof, Aargau
P. Langer, Fabrication des Lactas et parc avicole, Gland
E. Leibungut Hauptstrasse 24, Boniswil (Aargau)
Alfred Leutenegger, Geflügelfarm, Hobelwerkstrasse 11, Ober-Winterthur
J. Lieblich & Co., Eier en gros, Solothurnerstrasse 50, Basel
H. Loertscher, Inst. für Haustierernährung der ETH, Universitätsstrasse 2, Zurich
R. Löwensberg, Les Tombettes, Aigle (Vaud)
Arthur Lüchinger, Dornacherstrasse 34-36, Basel
L. Ludwig, Diethelm and Cie AG, Pharmazeutische, Abteilung, Talstraase 15, Zurich
P. H. Lutz, Geflügelhof Wattenbuhl, Oberrieden (Zurich)
J. Meier, Gelfügelfarm, Wurenlingen (Aargau)
E. Meisser, Schloss Binningen, Binningen, (Baselland)
M. Menzi, Morgenthalstrasse 21, Zurich

E. Mettler, SEG Bern Engehaldenstrasse, Bern
E. Millioud, Les Riedes, St. Blaise, Neuchatel
Mühle Geiser AG, Langenthal
Muhlen Aktiengesellschaft, Interlaken
Multiforsa AG, Zug-Steinhausen
Hans Nadler, Privat Heil-und Pflegeanstalt, Littenheid (Thurgau)
Albert Naef, Gutsverwalter, Bocken ob Horgen, Zurich
J. Nicod, Le Couvent, Granges, Vaud
E. Rau-Bosshardt, Geflügelzucht, Ulmiz bei Kerzers
Dr. Per Rignes, c/o F. Hoffman-LaRoche & Co., A. G. Grenzacherstrasse 124, Basel
Jean Rossi, Chemin de Tivoli 10, Pt.-Lancy, (Geneve)
Peter von Salis, Kreuzlingen
T. Schatzmann, Lenzburg (Aargau)
G. Schmidt, Veterinabakt. und Parasitologisches, Institut der Universität, Bern
C. Schnorf, Berkstrasse 4, Zurich 27, Postfach
August Schwere, Geflügelfarm Aarhof, Kleindottingen, Aargau
H. Sequin, Les Veus, Coppet, Near Geneva
Robert Stahel, Geflügelzucht, Nieder-Uster (Zurich)
Peter Stahlie, Geflügelhof Wintersberg, Wintersberg (St. Gallen)
H. Stärkle, Geflügelfarm Linerhof, Engelburg (St. G.)
P. Stauffer, Geflügelfarm Tannilhag, Staufer-Lentzburg
P. Steinegger, Schweiz-Geflügelzucht-schule, Zollikofen, Bern
W. Stettler, parc avicole, Versoix (Geneve)
J. Ph. Stoeckli, Les Paquerettes, Sion
F. L. Stoffel, Plombenfabrik, Horn (Thurgau)
G. Stolberg, Geflügelfarm Tannlibag, Staufen-Lenzburg
Max Sulser, SEG-Zurich, Glattsbrugg (Burich)
R. Troesch, Geflügelmästerei Dottingen
H. Tröhler, Rietgrabenstrasse 76, Opfikon (Zurich)
Hans Utinger, Getreide und Futtermittel Zug
P. Von Euw Geflügelfarm, Oberglatt (Zurich)
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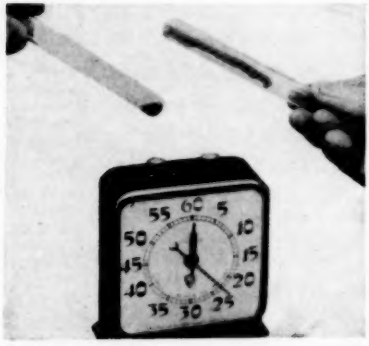

Prothrimbin and clotting tests prove the superior effectiveness of KLOTOGEN F in poultry feeds. Blood sample in the right test tube was from a chicken fed rations containing KLOTOGEN F as vitamin K source. It clotted in 23.5 seconds while blood in the left tube from the bird fed rations containing inadequate vitamin K was still fluid.

KLOTOGEN F, the modern vitamin K analog, does a superior job of protecting flocks against vitamin K deficiencies. Early laboratory tests proved KLOTOGEN F at least four times as effective as fat-soluble forms in the presence of excess sulfa (5). Later experiments showed KLOTOGEN F to be up to 10 times as effective as menadione in the presence of 0.1% sulfa in the diet, or three times as effective in the absence of sulfa medication (6). Work at West Virginia (7) showed a 6-time ratio of activity for KLOTOGEN F over menadione, i.e., 18 times as effective on a menadione equivalent basis, again even in the absence of sulfa.

Nutritionists like KLOTOGEN F because they know exactly how much vitamin K is going into each batch of feed . . . exactly how much is available to the flocks that consume it . . . and that it gives maximum effectiveness at lowest possible cost. Every lot of KLOTOGEN F is quantitatively assayed before it leaves Abbott Laboratories.

KLOTOGEN F solves vitamin K problems, for just a few cents per ton of finished feed! For full information about KLOTOGEN F, the superior vitamin K analog, write to Abbott Laboratories, Chemical Sales Division, North Chicago, Illinois.

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Manufacturers of Pro-Gen(R) (Arsanilic Acid, Abbott)
—poultry and swine feed additive.

(R)KLOTOGEN F—Stabilized Menadione Sodium Bisulfite, Abbott;
U. S. Patent No. 2367302

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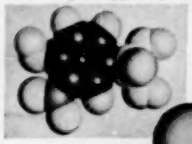
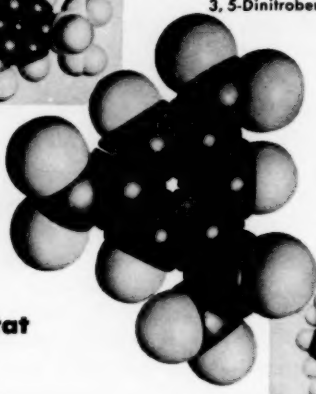
New COMPOUND

3-Nitro-4-hydroxyphenylarsonic acid



3, 5-Dinitrobenzamide



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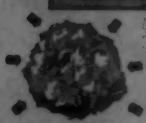
CHAS L DAVIDSON PRESIDENT STONE MOUNTAIN GRIT CO INC

Note Saving

Feeding Program	Growing Period	Weight	Feed Efficiency	Cost per lb. of Meat
All Mash—No Grit	9 wks	3.36	2.63	17.02
All Mash—With Fine (Chick) Size STONEMO	9 wks	3.42	2.59	16.78
All Mash—Recommended STONEMO Feeding Program	9 wks	3.44	2.55	16.53



Coarse Size Stonemo Granite Grit Supplied 3 Sizes

Considering all costs (chicks, feed, grit, and incidentals) a saving was made of almost ½¢ per lb. or $16.85 per thousand broilers. Chick cost was 13 cents. Average feed cost was $5 per hundred, and the Grit was figured at local retail cost of 1¢ per lb.

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